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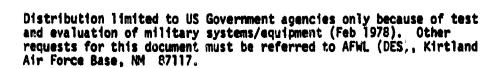
# **EFFECTS OF NONIDEAL SURFACE ON AIRBLAST** FROM ONE-MEGATON YIELDS

Mark A. Fry, Capt, USAF Gary P. Ganong, Maj, USAF James W. Aubrey

February 1978

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Finul Report



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Prepared for Director DEFENSE NUCLEAR AGENCY Washington, DC 20305

AIR FORCE WEAPONS LABORATORY Air Force Systems Command Kirtland Air Force Base, NM 87117



ADMINISTRATION.

This final report was prepared by the Air Force Weapons Laboratory, Kirtland Air Force Base, New Mexico under Job Order WDNB4405. Mr. James Aubrey (DES) was the Laboratory Project Officer-in-Charge.

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Lt Colonel, USAF

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20. ABSTRACT (Continued)

burst were low enough to produce hydrodynamic precursors. due to jetting above the ground, even without a hot layer of air. The addition of a hot layer increased the extent, effects, and duration of the precursor.



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# CONTENTS

<u>Section</u>		Page	
I	INTRODUCTION	3	
II	AFML SOUND SPEED THERMAL LAYER MODEL		
III ,	COMPUTATIONAL TECHNIQUES	19	
	Genera 1	19	
	Initial Conditions	21	
	Rezone Technique	22	
	Fireball Size and Fluences	24	
IV	SURFACE BURST	32	
	Genera 1	32	
	Ideal Case	32	
	Nonideal Case	32	
V	HEIGHT OF BURST CASES	41	
	Genera 1	41	
	Hydrodynamic Precursor	41	
	Heated Layer Effects	48	
VI.	CONCLUSIONS	64	
	REFERENCES	65	
	APPENDIX A: AFWL HULL CALCULATION OF 1-MT. IDEAL CASE	67	
	APPENDIX B: AFWL HULL CALCULATION OF 1-MT, PRECURSED CASE	97	

### SECTION I

### INTRODUCTION

The Airblast produced by nuclear detonations is a primary destructive mechanism. It is imperative from both a defensive and an offensive point of view to be able to predict its magnitude at various ground ranges. Using the experimental data of the Nevada Test Site (NTS) and the Pacific Proving Grounds (PPG), an array of information can be assembled that allows qualitative predictions of airblast. However, the effects of nonideal surfaces upon airblast for large yields would still be unknown since the NTS data are the primary sould airblast modifications from nonideal surfaces. The megaton class devices were done mostly over water at the PPG. Also the NTS data do not include megaton yields.

Then left is the task of theoretically predicting the effects of nonideal surfaces upon the airblast. A surface becomes nonideal when it is not perfectly reflecting. When a surface becomes heated by the thermal radiation of a nuclear detonation, it in turn heats the adjacent layer of air, raising the sound speed. Subsequently, the passing air shock encounters this heated layer and begins to move faster here than in the colder air above, resulting in the formation of the precursor. The fact that this heated layer does produce the precursor was theoretically verified by Ganong and Whitaker (ref. 1). In recent years a great deal of effort has gone into predicting what this heated layer should resemble for different soils and as a function of yield and height of burst (HOB).

Chambers (ref. 2) spent 2 years developing a thermal layer model from first principles. He attempted to model all the relevant physics of the formation of the heated layer through the use of a one-dimensional hydrodynamic computer code. Unfortunately, the number of unknowns and the inability to compare the details of a thermal model with experimental data made the use of the model unsatisfactory. Future experiments may make this approach more viable. In spite of the uncertainties in the model, Chambers did produce a thermal layer model with the use of the one-dimensional code developed while he was at the Air Force Meapons Laboratory (AFWL). A calculation of a 1-MT yield detonated at 1500 feet was completed using this model (ref. 3). Later, Prentice and Ganong (ref. 4), using the techniques developed by Chambers were able to model the thermal layer from a 10-kT nuclear event at 500-foot HOB.

For this study, a thermal layer model has been developed by Ganong (ref. 5). It is basically an analytical fit of the NTS sound speed measurements made above the ground prior to shock arrival versus fluence.\* The sound speed data come from several different nuclear events similar in yield.

The theoretical calculations that are reported here are 1-MT yields detonated at HOB of 0, 500, 750, and 1000 feet. Both the ideal and nonideal (heated layer) surface cases are presented so that direct comparisons can be made.

The conversion factors listed in table 1 are included for quick reference.

<sup>\*</sup> Fluence is defined here as the time integral of the thermal energy flux incident to a unit area of ground surface (ergs/sq cm). Flux is defined here as the rate of thermal energy incident to a unit area of ground surface (ergs/sq cm/sec).

Table 1

# CONVERSION FACTORS FOR U.S. CUSTOMARY TO METRIC (SI) UNITS OF MEASUREMENT

To Convert From	To	Multiply By
angstrom	meters (m)	1.000 000 X E -10
atmosphere (normal)	kilo pascal (kPa)	1.013 25 X E +2
bar	kilo pascal (kPa)	1.000 000 X E +2
barn	meter² (m²)	1.000 000 X E -28
British thermal unit (thermochemical)	joule (J)	1.054 350 X E +3
calorie (thermochemical)	joule (J)	4.184 000
cal (thermochemical)/cm²	mega joule/ $m^2$ (MJ/ $m^2$ )	4.164 000 X E -2
curis	g <b>iga</b> becquerel (GBq)*	3.700 000 X E +1
degree (angle)	radian (rad)	1.745 329 X E -2
degree Fahrenheit	degree kelvin (K)	$\tau_{\kappa} = (t^* f + 459.67)/1.8$
electron volt	joule (J)	1.602 19 X E -19
erg	joule (J)	1.000 000 X E -7
erg/second	watt (W)	1.000 000 X E -7
foot	meter (m)	3.048 000 X E -1
foot-pound-force	joule (J)	1.355 818
gallon (U.S. liquid)	meter <sup>3</sup> (m³)	3.785 412 X E -3
inch	meter (m)	2.540 000 X E -?
jerk	joule (J)	1.000 000 X E +9
joule/kilogram (J/kg) (radiation dose absorbed)	Gray (Gy)**	1.000 000
kilotons	terajoules	4.183
kip (1000 lbf)	newton (N)	4.448 222 X E +3
kip/inch² (ksi)	kilo pascal (kPa)	6.994 757 X E +3
ktar	newton-second/m² (N-s/m²)	1.000 000 X E +2
micron	meter (m)	1.000 000 X E -6
mi ì	meter (m)	2.540 000 X E -5
mile (international)	meter (m)	1.609 344 X E +3
ounce	kilogram (kg)	2.834 952 X E -2
pound-force (1bf avoirdupois)	newton (N)	4.448 222

Table 1 (cont'd)

To Convert From	To	Multiply By
pound-force inch	newton-meter (N·m)	1.129 848 X E -1
pound-force/inch	newton/meter (N/m)	1.751 268 X E +2
pound-force/foot <sup>2</sup>	kilo pascal (kPa)	4.788 026 X E -2
pound-force/inch² (psi)	kilo pascal (kPa)	6.894 757
pcund-mass (1bm avoirdupois)	kilogram (kg)	4.535 924 X E -1
<pre>pound-mass-foot<sup>2</sup> moment   of inertial)</pre>	kilogram-meter² (kg·m²)	4.214 011 X E -2
pound-mass/foot1	kilogram/meter³ (kg/m³)	1.601 846 X E +1
rad (radiation dose absorbed)	Gray (Gy)**	1.000 000 X E -2
roentgen	coulomb/kilogram (C/kg)	2.579 760 X E -4
shake	second (s)	1.000 000 X E -8
slug	kilogram 🔫	1.459 390 X E +1
torr (mm Hg, O'C)	kilo pascal (kPa)	1.335 22 X E -1

<sup>\*</sup> The becquerel (Bq) is the SI unit of dioactivity; 1 Bq = 1 event/s.

A more complete listing of conversions by be found in "Metric Practice Guide E 380-74," American Society for Esting and Materials.

<sup>\*\*</sup> The Gray (Gy) is the SI unit of absorbed radiation.

# SECTION II

### AFWL SOUND SPEED THERMAL LAYER MODEL

The thermal layer model used in these calculations is empirically derived from a series of NTS nuclear events. The preshock arrival measurements of sound speed were made at different altitudes above ground and at different ranges for events Tumbler 3 and 4, Teapot 12, and Upshot Knothole 9. An analytical fit of the fluence versus sound speed was made using these data. Then, if the fluence at any given ground range is known, the temperature or internal energy is known and the thermal layer is prescribed.

The data from the above NTS events contain temperature as well as sound speed measurements. Temperature measurements represent local values. Reviewing film records of the NTS events (ref. 6) revuals the phenomenon of individual parcels of hot air rising randomly from the ground surface. This effect indicates that three-dimensional effects are important. Further, the temperature versus time records (ref. 7) from Operation Tumbler show a sharp rise to a peak after the thermal energy threshold is met. Then there is a decrease until shock arrival time. Hot parcels of air can be associated with this temperature waveform. Various gauges at the same ground range and altitude show different timing and different peaks for the blowoff. Thus, the temperature measurements would not be meaningful unless they were somehow averaged. On the other hand, the sound speed values were taken over a finite path length and would represent an integrated measure at a given ground range. Finally, these data do represent a direct link to a nuclear case; they are simple and straightforward to use; and their use reproduces within 25 percent the overpressures from the NTS event, Priscilla (refs. 8, 9, and 10).

Figures 1 through 5 are plots of sound speed versus fluence for the five levels above ground surface. A certain amount of scatter is present but a trend does exist. The analytical expression chosen as a fit to these data is

$$C = C_0 + \sqrt{F - F_0} \times (A_{1e}^{-\Delta Z/B} + A_{2e}^{-2\Delta Z/B} + A_{3e}^{-2\Delta Z/B})$$

*};...* 

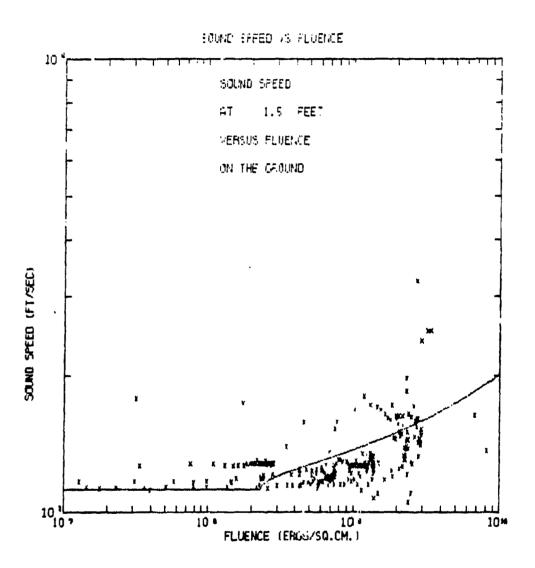


Figure 1. Sound Speed versus Fluence at 1.5 Feet

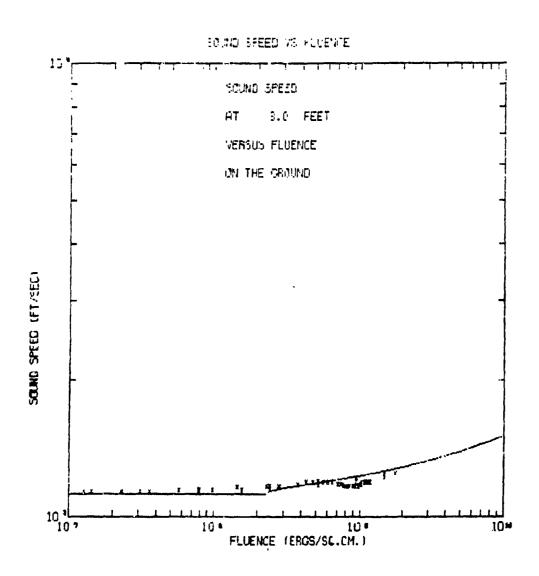


Figure 2. Sound Speed versus Fluence at 3.0 Feet

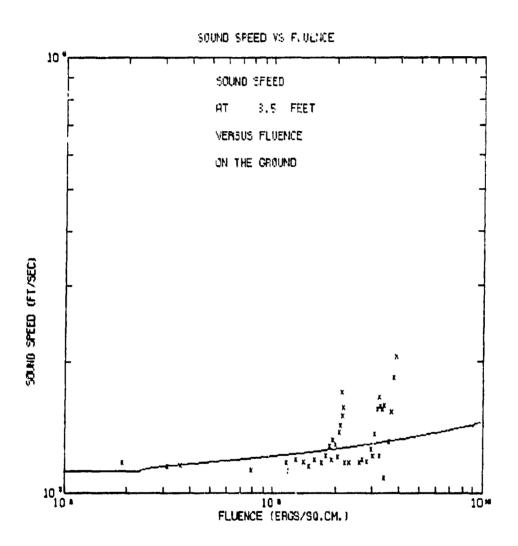


Figure 3. Sound Speed versus Fluence at 3.5 Feet

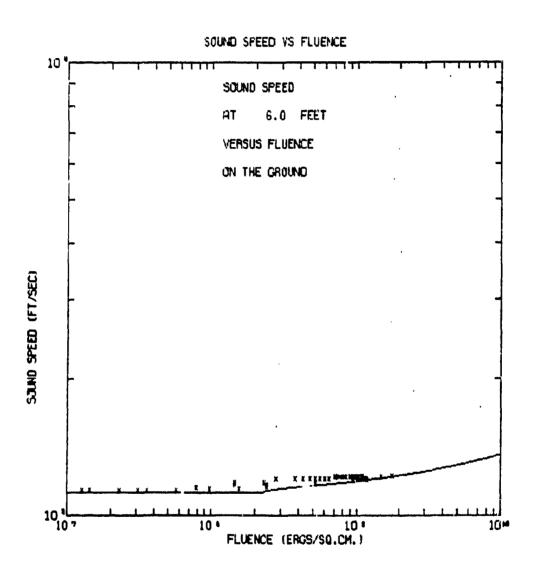


Figure 4. Sound Speed versus Fluence at 6.0 Feet

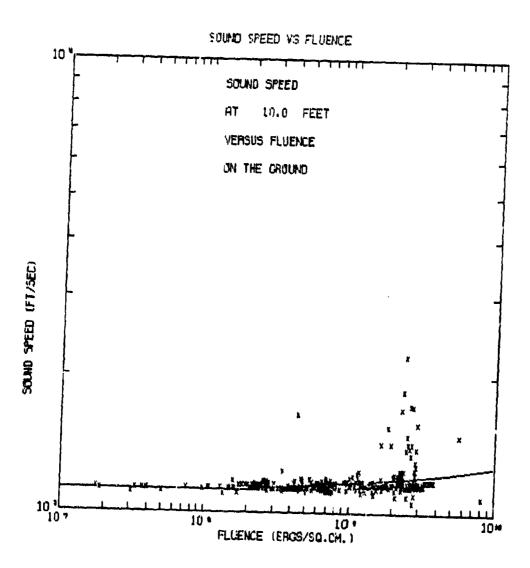


Figure 5. Sound Speed versus Fluence at 10.0 Feet

Here, C is the sound speed in cm/sec at a height  $\Delta Z$  (cm) in the thermal layer;  $C_0$  is the ambient sound speed; F is the fluence;  $F_0$  is the threshold fluence necessary for soil blowoff; and the A's were obtained from a least squares fit of the data. The constant B was arbitrarily chosen as 1.325 neters to allow 90 percent decay of the slowest decaying exponential at 3 meters above ground. If fireball motion is included in the analysis, the following values are obtained:

 $C_0$  = 34229 cm/sec B = 132.5 cm  $A_1$  = 0.6085 (cm/sec/(ergs/sq cm)<sup>1/2</sup>)  $A_2$  = -1.7795 (cm/sec/(ergs/sq cm)<sup>1/2</sup>)  $A_3$  = 2.0692 (cm/sec/(ergs/sq cm)<sup>1/2</sup>)  $F_0$  = 2.3 x 10° (ergs/sq cm)

It is physically reasonable to relate the sound speed to the square root of the fluence. The choice of the exponential factors is arbitrary, but does give a reasonably good fit.

In order to investigate the validity of this thermal layer model and compare it to other available models, a series of benchmark calculations was completed. Some of the procedures developed in those benchmark calculations (ref. 11) are utilized here. The NTS event, Priscilla, was simulated using SPUTTER input scaled to 36.6 KT. In addition, because of a series of 10-KT tests done at NTS, a benchmark calculation simulating that generic yield and HCB was done.

The calculation of 36.6 KT at 700 foot HOB gives very good agreement with the experimental data. Both overpressure and dynamic pressure peak values versus range are plotted in figures 6 and 7. The dashed line represents the results from the calculation using the AFWL sound speed fit. As a comparison to this model, the calculation was repeated with the photo fit model developed by Science Applications (ref. 12). The photo fit model obtains temperatures in the heated layer by analyzing the NTS high speed photography. Comparison of the two models shows little difference, although the AFWL model compares better with the dynamic pressure data.

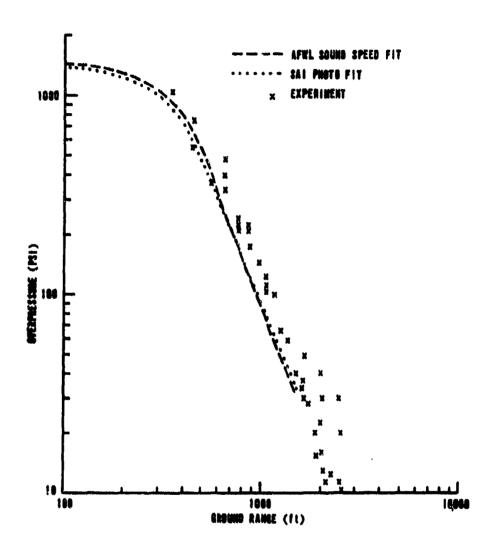


Figure 6. Priscilla Peak Overpressure versus Range

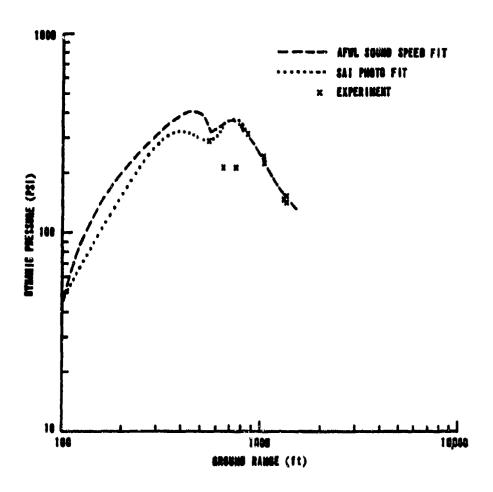


Figure 7. Priscilla Peak Dynamic Pressure versus Range

Figures 8 and 9 are overpressure and dynamic pressure peak values plotted against distance for the generic 10-KT case. The data for this benchmark comes from several events. The legend distinguishes between three events. Agreement between the calculations and the experimental data is fair. Dynamic pressure peaks for both models appear to be high compared to the data, but the AFWL sound speed fit has the best agreement.

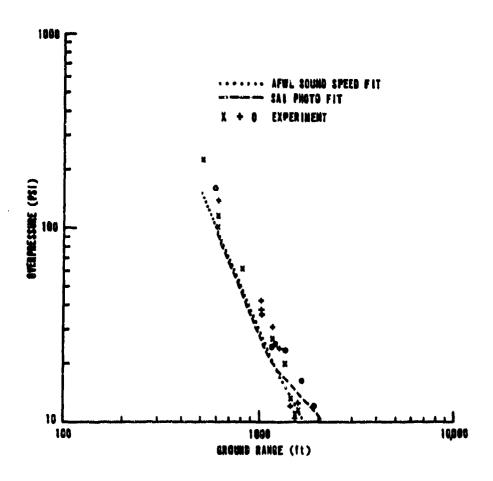


Figure 8. Peak Overpressure versus Range for 10 KT at 500 Feet HOB

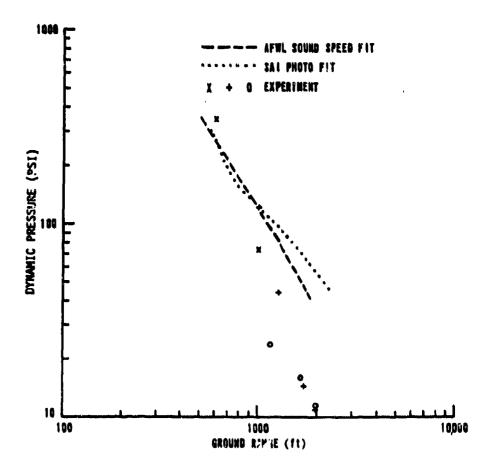


Figure 9. Dynamic Pressure versus Range for 10 KT at 500 Feet HGB

# SECTION III COMPUTATIONAL TECHNIQUES

# **GENERAL**

The AFWL HULL code (ref. 13) was used for the calculations reported here. Initial conditions were provided by results from one-dimensional SPUTTER calculations (ref. 14). The SPUTTER calculations represent the early-time part of the nuclear detonation and solve the radiation transport equation as a function of time. For the calculation of this study, a new rezone technique was devised to finely zone the area of the precursor, and an algorithm was created to account for the size of the fireball as a function of time

All of the calculations reported here utilized similar zoning. The approach was to zone coarsely, that is, to require zones in the region of the precursor to be initially 1 to 3 meters in length. Outside that region, variable zoning was used. Table 2 presents zone configurations for the calculations. Figure 10 indicates typical initial zoning. Initially the zones are all of equal radial size ( $\Delta X = 2$  meters typically). The vertical zone size, once it is set, remains constant for the entire problem. A typical vertical zone size will be 60 cm in the first few zones near the ground and then the size will gradually increase by a factor of about 1.05 for the rest of the zones.

Table 2

ZONE CONFIGURATIONS FOR CALCULATIONS

	1 MT	YIELDS	S Vertical Zone Size at Ground	
HOB (ft)	No. Zones (X)	No. Zones (Y)	(meters) (meters)	Size at HOB (meters)
0	120	120	0.6	0.6
500	120	164	0.6	2.2
750	120	196	0.6	2.7
1000	120	190	0.6	3.0

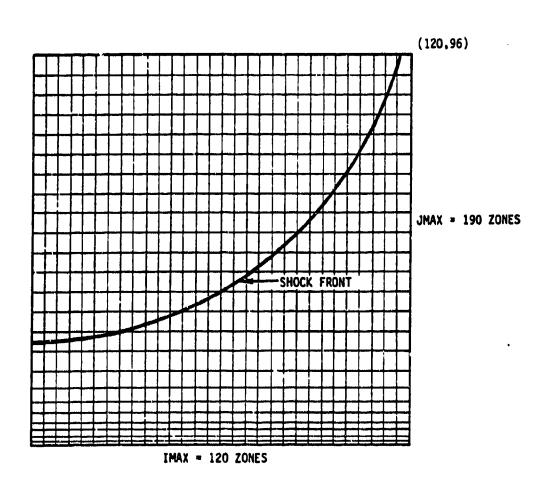


Figure 10. Typical Initial Zoning of Lower 96 Layers of Mesh, Showing Every 4th Zone Boundary

# INITIAL CONDITIONS

SPUTTER 1-D calculations were used as initial conditions for both the benchmark and the megaton yield calculations. The SPUTTER calculations were chosen to best represent the yield and HOB. They were then scaled to the appropriate values. The scaling laws used are

Radius

$$r_2 = \left(\frac{P_{01}}{P_{02}}\right)^{1/2} \left(\frac{W_2}{W_1}\right)^{1/3} \cdot r_1$$

Pressure

$$P_2 = \frac{P_{02}}{P_{01}} P_1$$

Time

$$t_2 = \left(\frac{P_{e1}}{P_{e2}}\right)^{1/3} \frac{C_{e1}}{C_{e2}} \left(\frac{W_2}{W_1}\right)^{1/3} \cdot t_1$$

Density

$$\rho_2 = \frac{\rho_{\psi 2}}{\rho_{\psi 1}} \, \rho_1$$

Velocity

where

r = radius from detonation

P = static pressure

W = yfeld

t = time

C = sound speed

p " density

V ™ velocity

The subscripts 0, 1, and 2 refer to ambient conditions, event 1, and event 2, respectively.

For Priscilla, SPUTTER calculation FB14 was used. FB14 was a 30-KT, sealevel burst scaled to 36.6 KT at 3778 feet above sea level. (Ground level was at 3078 feet.) The 10-KT cases used FB14 at seal level. It was scaled to 10 KT at 3578 feet above sea level. For the megaton calculations FR10 was used. It was a 3.8-MT case at sea level and was scaled to 1 MT and to the appropriate HOB. Different starting times were used for each calculation. At the surface and as the HOB increases, larger starting times can be used. The starting times are detailed below.

1-MT-Burst (ft)	Starting Time after Scaling (msec)	
Surface	38.3	
500	4.15	
750	10.3	
1000	12.2	

Since the input is one dimension, then horizontal histograms of density, specific internal energy, and radial velocity at the HOB will suffice to describe the source completely.

# REZONE TECHNIQUE

Since the conditions of the shock front along the ground are of interest, adequate zoning in that region is required. Furthermore, the number of computation zones should be minimized to reduce computing costs. What has been developed (ref. 15) is a rezone in cylindrical coordinates that looks for the maximum dynamic pressure  $\frac{\rho v^2}{2}$  along the ground. The method adopted requires constant zoning on each side of that peak and then increases each outward and inward zone by 5 percent of the former zone size. Zoning in the azimuthal direction remains fixed, but is close to the constant zone size of the shock front in the radial direction. Increasing zone sizes of approximately 10 percent is allowed above the HOB. Figure 11 indicates the typical zoning obtained by this rezone.

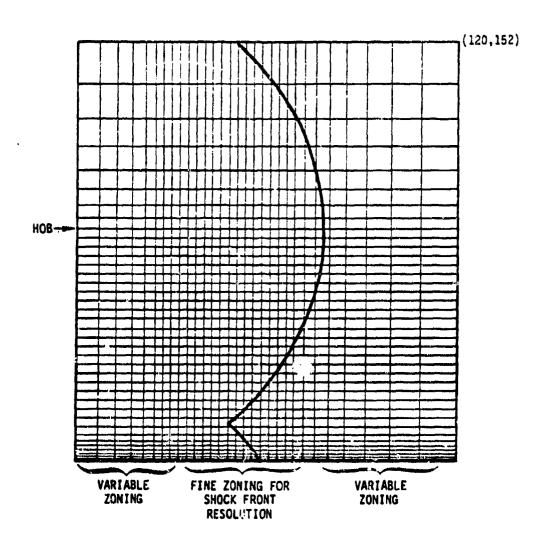


Figure 11. Typical Zoning, in Lower 152 Layers of Mesh, Produced by the Rezone Technique

## FIREBALL SIZE AND FLUENCES

One of the important considerations in determining the value of fluence used at specific ground ranges, particularly those close to the fireball, is the physical extent of the fireball. Assuming, for simplicity, that the fireball shape is sperical and the energy passing through the unit area of the sphere is constant at any given time (only its radius changing with time), the radient energy onto the ground can be integrated to obtain the flux.

Furthermore, for the zero HOB case, a hemisphere is assumed for the fireball shape.

The expression for the flux upon the ground is defined as

$$F = \int \vec{\Omega} \cdot \vec{n} d\omega$$

where according to figure 12

r = range from center of burst

R = radius of fireball

n = unit normal to ground

 $\vec{\Omega}$  = radiant energy vector or intensity vector

The case for the surface burst is drawn in figure 12a while figure 12b indicates the HOB case. For the surface case, that is HOB = 0, we can derive the flux incident upon the ground in the following manner.

Flux = 
$$\int \vec{\Omega} \cdot \vec{n} d\omega$$

Then by identities

Flux = 
$$\int I_0 \sin \theta \cos \phi \sin \theta d\theta d\phi$$

The integration is from

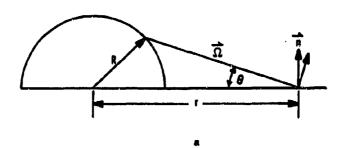
$$\phi = -\pi/2 \text{ to } \pi/2$$

$$\theta = 0$$
 to  $\theta_{max}$ 

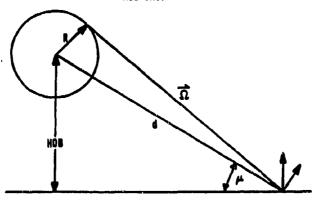
where

$$\theta_{\text{max}} = \text{Sin}^{-1} \left(\frac{R}{r}\right)$$

# SURFACE



# HOB CASI



ь

Figure 12. Geometry for Deriving Incident Flux

Performing the integration, the result is

Flux = 
$$2I_0 \left[ \frac{\theta_{max}}{2} - 1/2 \sin \theta_{max} \cos \theta_{max} \right]$$

or

= 
$$I_0 \left[ \left( \sin^{-1} \frac{R}{r} \right) - \frac{R}{r} \sqrt{1 - R^2/r^2} \right]$$

For the case in figure 12b, a point source is simply assumed. As long as the fireball sphere does not touch the ground, this source is equivalent to a spherical source. That is

Flux = 
$$I_0 \frac{R^2}{d^2} Sin \mu$$

wherein u is equal to the angle formed by d with the ground.

After determining the flux, the fluence at the pertinent ground ranges for the particular device yield and HOB must be obtained. An important part of this procedure is a FORTRAN subroutine FBLOSS which provides the amount of energy radiated by a fireball as a function of time. This routine was developed by Sharp (ref. 16), who analytically fitted the data from the SPUTTER calculations. Further, knowing the radius versus time of the fireball (ref. 17), one can solve for the intensity of the fireball. Then the desired fluence may be obtained by integrating over time.

In this procedure, the effects of the fireball motion are neglected. The fireball will begin to rise due to buoyancy effects, and its effect on the fluence upon the ground may be important. To investigate this possible modification of integrated flux as a function of time and ground range, the fluence for both cases was computed. One case is a fixed fireball at the HOB; the other one rises. The rise rate for the latter was obtained from a two-dimensional calculation done with very coarse zoning. Particles were placed within the radius of the fireball; and since the particles are constrained to move with the flow, their average altitude at any time is a good representation of the fireball altitude. Figure 13 indicates the results for the 500-ft HOB case. Fluence versus ground range is plotted for different times. At 0.14 sec and a ground range of 655 meters, the difference is about 30 percent in fluence. However, significant shock arrival times center around 0.10 sec. These arrival times correspond to a radial distance of 500 to 600 meters. For MX designs, the ground range at 600 psi is of interest. The free-field ideal ground range is

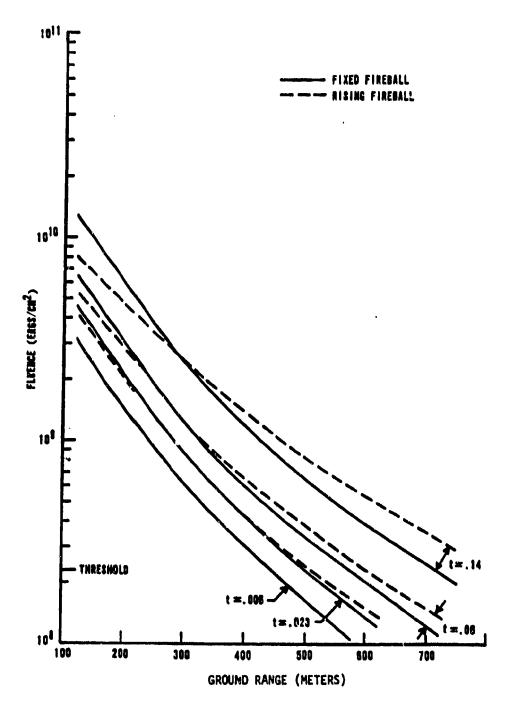


Figure 13. Fireball Fluence versus Ground Range

approximately 540 meters for the 690-psi pressure level from a 1-MT surface burst. At 0.124 sec and 609 meters ground range, the difference is approximately 20 percent. This value grows to 33 percent at 0.154 sec and 731 meters ground range.

In order to examine this effect at shock arrival time, the fluence versus ground range at shock arrival time has been plotted in figure 14. The differences begin at 300 meters ground range, but for distances less than 500 meters, the difference is less than 10 percent.

If the effect of the rising fireball had been included, it would have increased the fluence at larger ground ranges and extended the duration of the precursor effect. For a burst at 500 feet above the ground, the effect is at most 30 percent in the fluence before the shock arrival times of interest. After that time the heated layer is turned off and no further energy is added.

At the other end of this parameter study (the 1000-foot HOB), less effect from the rise of the fireball is seen. Figure 15 compares the rise rate for the 500- and 1000-foot HOB cases. The figure shows that the latter rises less during the same time than the 500-ft case. The net result is to minimize the difference in fluence upon the ground between the fixed and rising fireballs at later times.

As mentioned above, the algorithm for determining the fireball radius as a function of time comes from the 1-KT standard. The form is written for 1 KT as

$$R_{TKT} = 2.5684 \times 10^4 \times t^{0.398}$$

for

0 < t < 0.265 sec

and

$$R_{1KT} = (1.0 - B \times t^{C}) \times (D \times t + E) + 500$$

for

t > 0.265 sec

where

B = 0.03499

C = -1.068

D = 33897

E = 8490

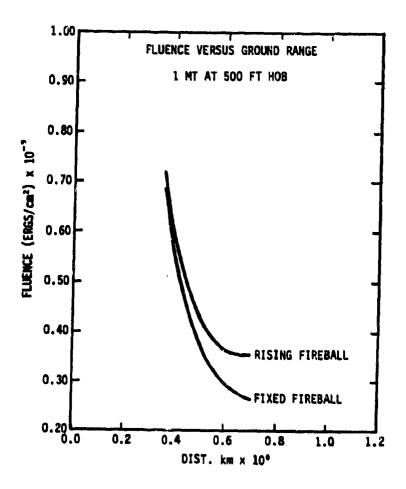


Figure 14. Fluence at Shock Arrival versus Ground Range

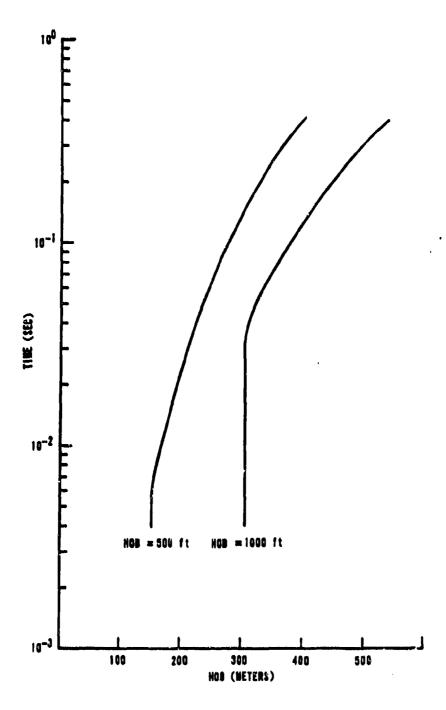


Figure 15. Height of Fireball Center versus Time

The time must first be scaled as follows:

$$T = T/W^{1/3} - \frac{\sec}{KT^{1/3}}$$

Then to find the radius for 1 MT, scale as follows:

$$\mathbb{Q}(\mathsf{FT}) = \mathsf{R}_{\mathsf{TKT}}(\mathsf{W})^{1/3}$$

# SECTION IV

## SURFACE BURST

## **GENERAL**

This study began with an attempt to determine if a high pressure precursor would develop from a surface burst. A surface burst was defined as a nuclear detonation at zero HOB. The ground surface is represented as a perfectly reflecting surface, although the air layer near the ground is modified as if there were an interacting ground. From the calculation of the surface burst, there is a clear indication of a significant precursor at the 600-psi level.

Previous calculations of precursed environments for 1-MT cases indicated no precursor formation above 300 psi (ref. 3). However, those cases considered were for 1500 and 2000 ft HOB. In addition, the thermal layer model used was different.

## IDEAL CASE

Since zoning affects obtainable peak pressure values, an ideal case was computed as a comparison. Ideal surface calculations were completed for each of the calculations reported here. The ideal surface burst case results are presented in appendix A. Listed are times, ground range associated with the peak overpressure, ground range associated with the peak dynamic pressure, and the peak dynamic pressure.

# NON IDEAL CASE

The precursed surface burst case began to show differences at approximately 1000 psi. In figure 16 one can see the initial toeing out due to the heated layer ahead of the shock front. In figures 17 and 18, peak overpressure waveforms for the ideal and precursed cases are compared. On the front side of the precursed waveform a modification can be seen. The rise time to the peak is lengthened considerably while the peak value is decreased approximately 20 percent. Figures 19 and 20 show that for the precursor the peak dynamic pressure was increased only about 10 percent. The small discontinuities on the waveforms correspond to rezones.

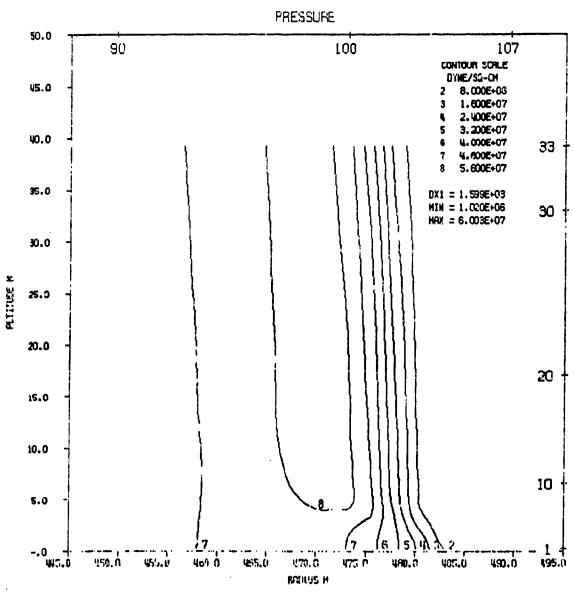


Figure 16. Pressure Contours Showing the Initial Toeing Ahead of the Shock Front

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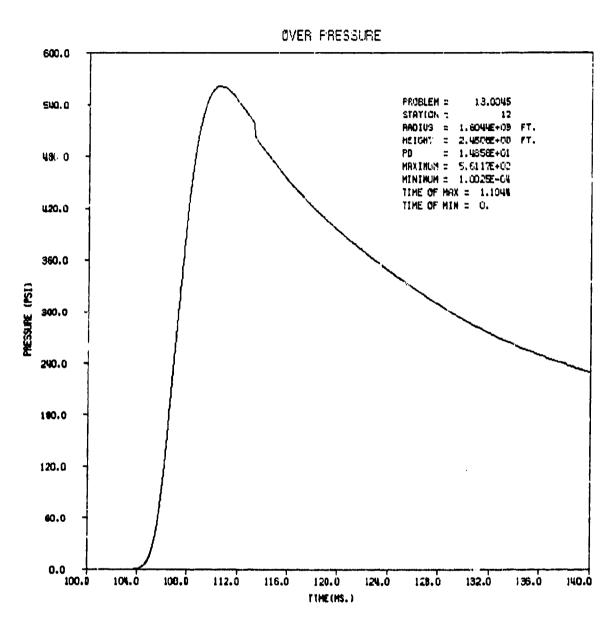


Figure 17. Overpressure versus Time Ideal Case 1 MT Surface Burst

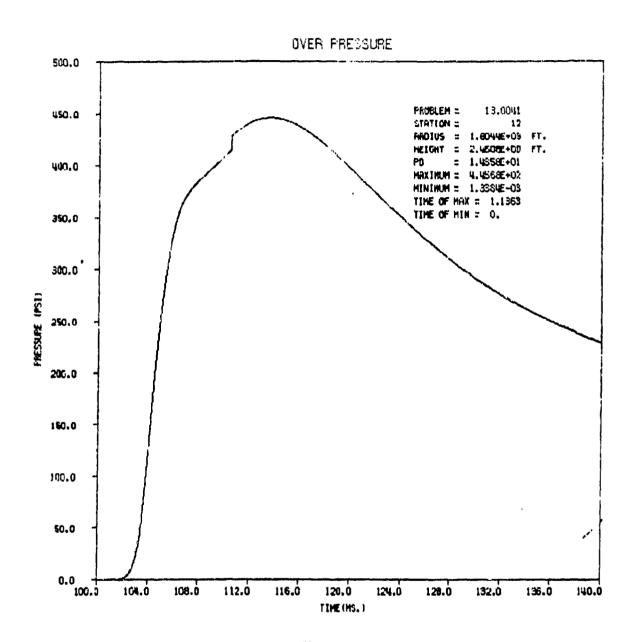


Figure 18. Overpressure versus Time, Precursed Case 1 MT Surface Burst

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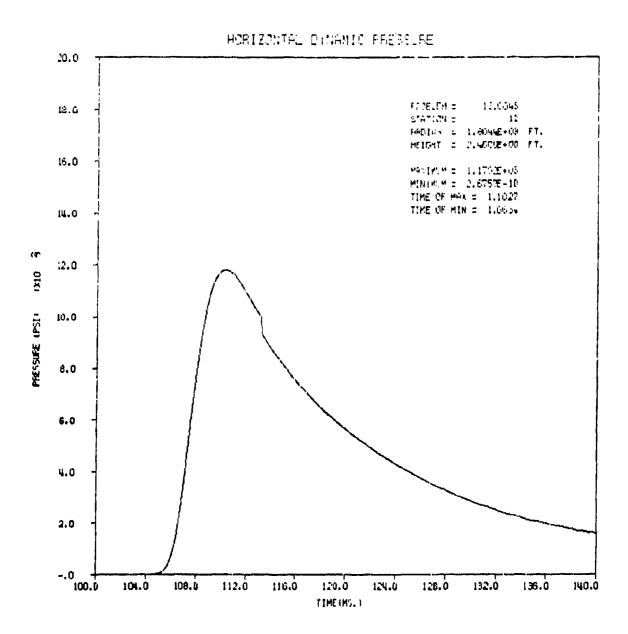


Figure 19. Horizontal Dynamic Pressure versus Time Ideal Cage 1 MT Surface Burst

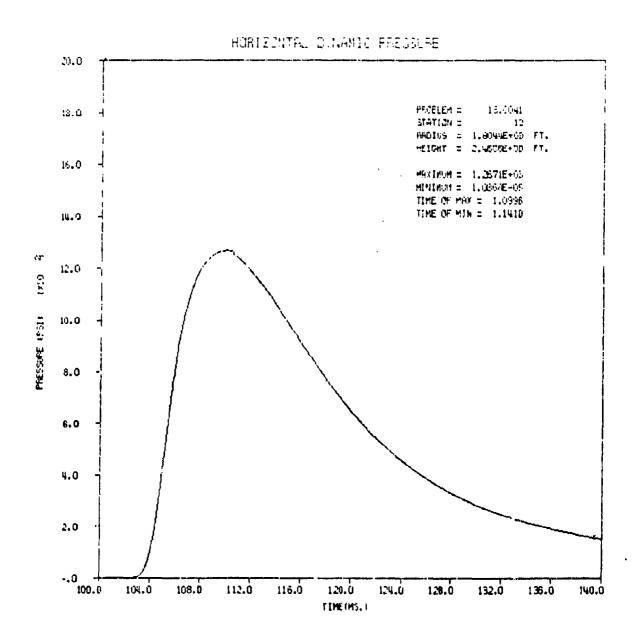


Figure 20. Horizontal Dynamic Pressure versus Time Precursed Case 1 MT Surface Burst

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Appendix B contains the tabulated values of peak pressure and dynamic pressure versus ground range. In figure 21 the peak overpressures versus range are plotted. Problem 13.0041 refers to the precursed case while 13.0045 and 13.0143 refer to the ideal case. For the range 450 to 750 meters the peaks are decreased considerably. The maximum difference occurs at approximately 600 meters. Figure 22 is a plot of dynamic pressure versus range. The maximum difference in dynamic pressure occurs at approximately 475 meters. Between 400 and 500 meters the heated layer acts on the shock front in the expected way. The overpressures are dropped as the shock front toes out, producing the "front porch" effect. Conversely, the dynamic pressures are increased. However, because of the low angle of incidence between the fireball and the ground, the fluence drops very rapidly as the ground range increases. Beyond 700 meters the overpressures are beginning to converge while the dynamic pressures have converged to the ideal case.

There is also an effect from the way in which the thermal layer model is implemented into the hydrodynamic mesh. The thermal layer model prescribes appropriate internal energy at any given time. We assume pressure equilibrium will be maintained. Therefore, we iterate upon the equation of state to reach this condition with the ambient atmosphere. In general, the assumption of pressure equilibrium decreases the density in the thermal layer, influencing the resulting dynamic pressures.

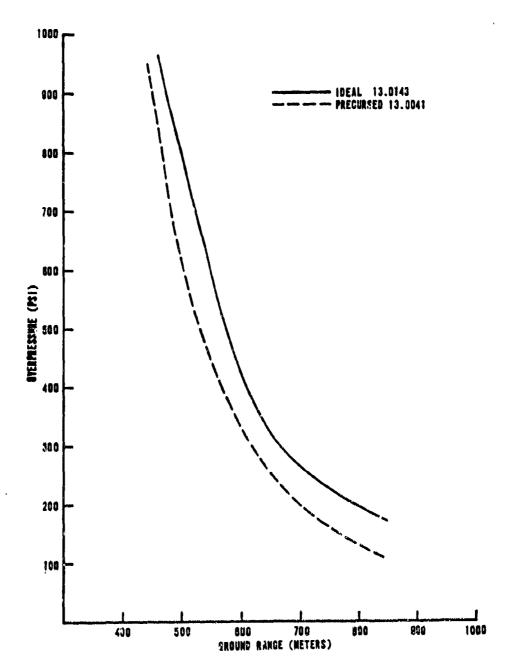


Figure 21. 1 MT Surface Burst Overpressures versus Range

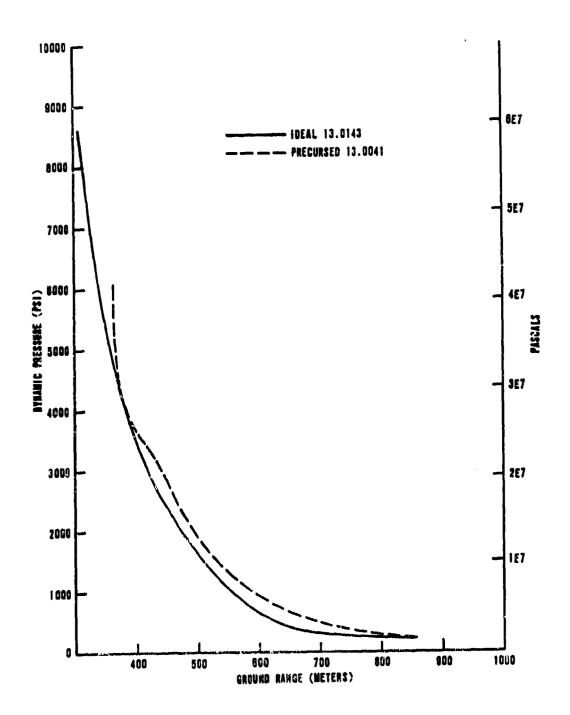


Figure 22. 1 MT Surface Burst Dynamic Pressure versus Range

#### SECTION V

#### HEIGHT OF BURST CASES

#### **GENERAL**

All of the HOB cases show strong precursor effects. In general, the peak overpressures are reduced by as much as a factor of 2, while the dynamic pressures are increased as much as 50 percent. The effect of the precursor is definitely influenced by the HOB. As the HOB increases from 500 to 1000 feet, the precursor effect moves outward in ground range and influences the lower pressure levels. In addition, a significant modification of the blast wave front exists for the ideal case. This phenomenon is called the "hydrodynamic precursor." When the word precursor is used alone, it refers to that phenomenon created by the thermal layer.

At the point of maximum density, approximately 160 meters out along the ground, the flow is outward parallel to the ground. A few meters beyond that and just above the ground, the flow is directed downward. The existence of the very sharp gradient in both density and pressure, coupled with the flow pattern, leads to the toeing out of the shock front along the ground. These effects can be seen in figures 23, 24, and 26. Further out in time the triple point has migrated upward and outward. The specific energy contours (figure 25) indicate where the fireball is located. Figure 27 indicates the approximate position of the triple point starts at 15 msec. Immediately thereafter, one begins to see the appearance of double peaks along the ground. In figure 28 can be seen the behavior of the double peaks with time.

A precursor peak appears on the leading edge beyond 20 msec. By that time the triple point is approximately 5 meters in altitude. The precursor becomes equal to the main wave at 40 msec.

### HYDRODYNAMIC PRECURSOR

As the HOB of the nuclear detonation approaches the ground surface, the incident pressure on the ground increases and consequently the reflected pressure increases. Because of these extremely high pressures (10° psi) and the resultant compression of the air medium at the ground surface, densities are reached which

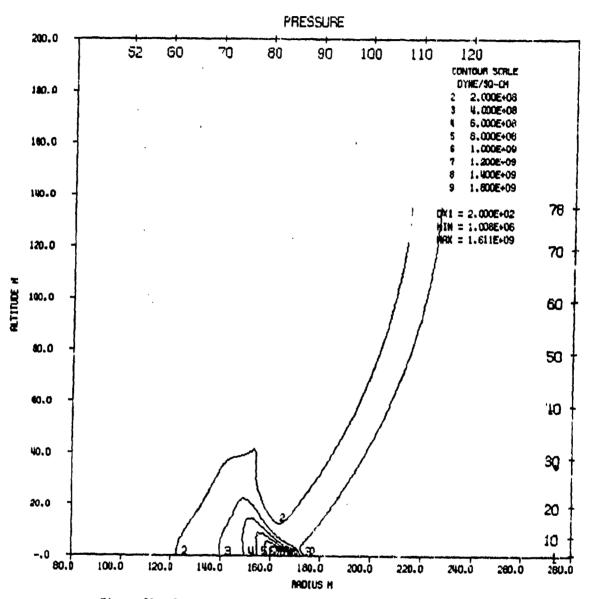


Figure 23. Pressure Contours for 1 MT at 500 Feet HOB. Ideal Case at 15 msec

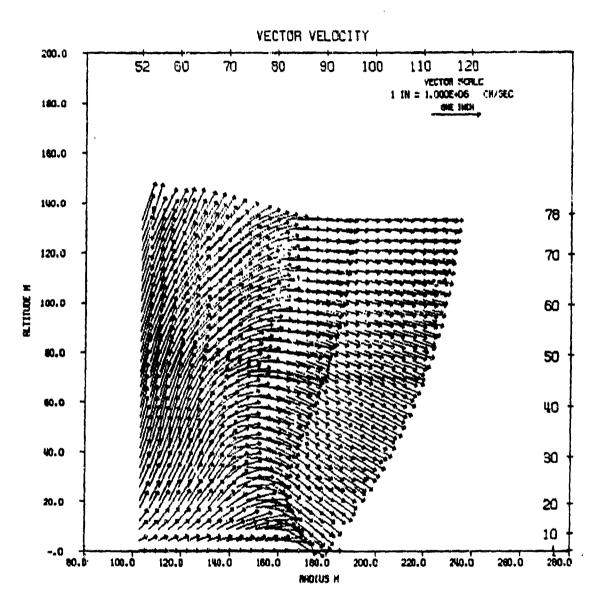


Figure 24. Velocity Vectors for 1 MT at 500 Feet HOB, Ideal Case at 15 msec

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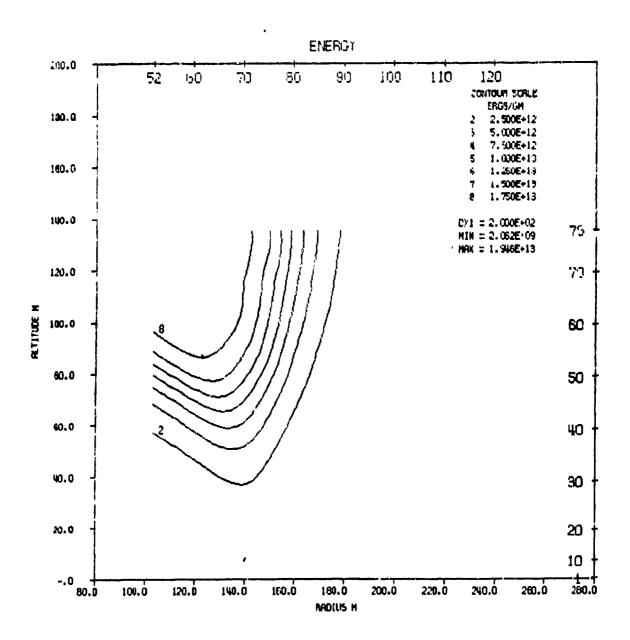


Figure 25. Energy Contours for 1 MT at 500 Feet HOB, Ideal Case at 15 msec

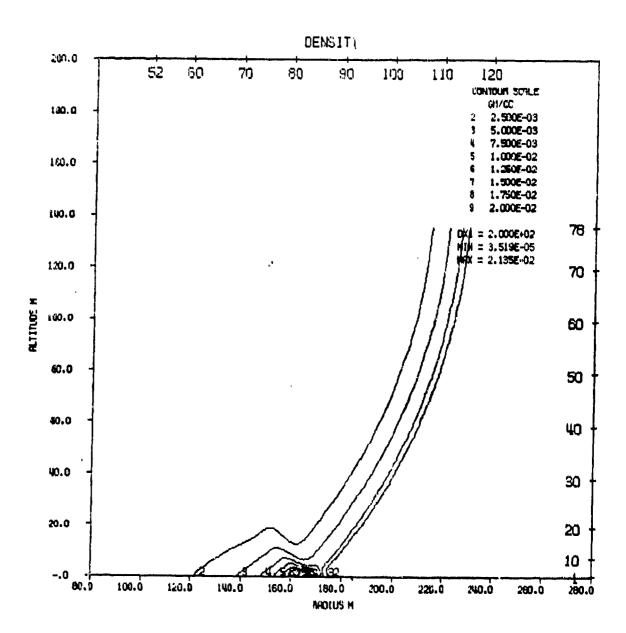


Figure 26. Density Contours for 1 MT at 500 Feet HOB, Ideal Case at 15 msec

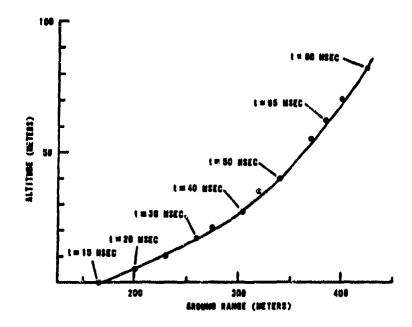


Figure 27. Triple Point Fosition for 1 MT at 500 Feet HOB, Ideal Case

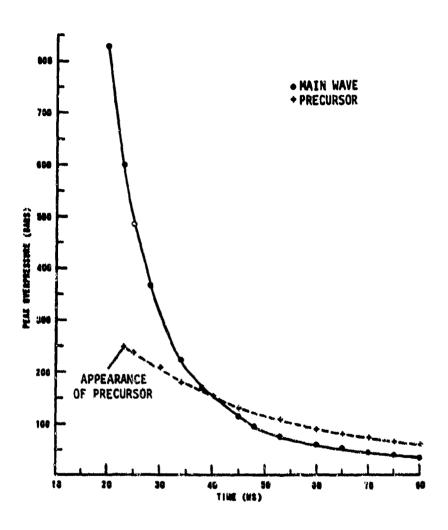


Figure 28. Peak Overpressure versus Time due to Precursor and Main Wave for 1 MT at 500 Feet HOB, Ideal Case

are approximately 20 times that of ambient air. The large densities and pressures develop a flow field which leads to the toeing out of the shock front.

This effect is shown in figures 29 through 32. To illustrate this point, the time of 30 msec was chosen. The contour plots show the two pressure peaks along the ground. The histogram plots, figures 33a through 33d, show the precursor is pronounced near the ground and decreases rapidly as one approaches the triple point, about 17 meters in altitude at a range of 260 meters. The overall appearance of the hydrodynamically precursed shock front at this point looks very much like a thermal layer precursor.

## HEATED LAYER EFFECTS

Salara Maria Caralina Calana

When the heated layer produced by the thermal radiation is added to the calculation, the shock front is further modified. The result appears to be an enhancement of the toeing-out effect. In addition, peak pressures are reduced while the peak dynamic pressures are enhanced.

As the double peak in the shock front develops along the ground, the leading peak becomes the maximum. The effect of the thermal layer is to reduce this peak, thus reducing the maximum peak overpressure.

The most significant effect of the thermal layer along the ground combined with the varying HOB is the modification of the shock front at different ground ranges. At 500-ft HOB, modifications exist at several thousand psi. At 750-ft HOB, the modification begins at about 700 psi and continues beyond the times run for the calculation. At 1000-ft HOB, modification starts at about the 300-psi level and continues to times beyond calculation time. It is apparent that the precursor effect is very sensitive to HOB. For maximum modification at the ground range for which 600 psi occurs, the 750-ft HOB case is optimum. The following figures show a comparison of the ideal and precursed calculations for the three cases. Peak overpressures are presented in figures 34a through 34c, and peak dynamic pressures are presented in figures 35a through 35c.

The above result is reasonable from considerations of fluence upon the ground. As the HOB increases, the size of the angle between the slant range and the ground increases, increasing the amount of fluence for a given ground range. Also, the reflected shock strength decreases as the HOB is increased, leading to larger ground ranges before the Mach stem (in the ideal sense) can be formed. This conclusion is also consistent with the result of the previous 1-MT calculation (ref. 3).

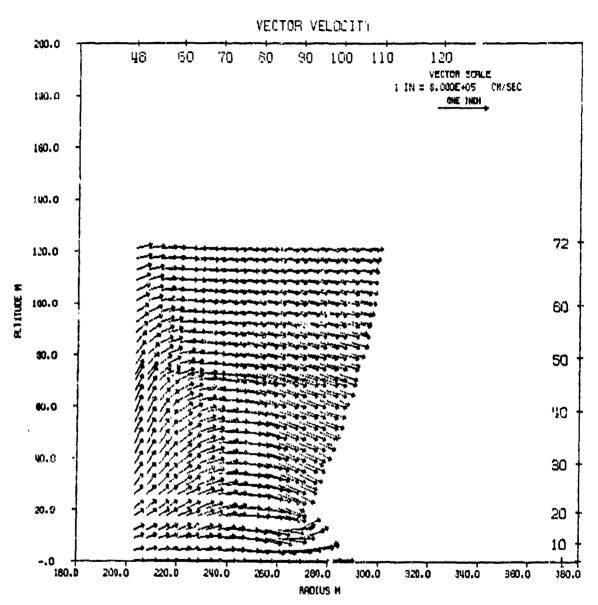


Figure 29. Velocity Vectors for 1 MT at 500 Feet HOB, Ideal Case at 30 msec

مر ريفه في خليب المدينة على الله المراجعة المؤلفة المراجعة المعارضة المعارض

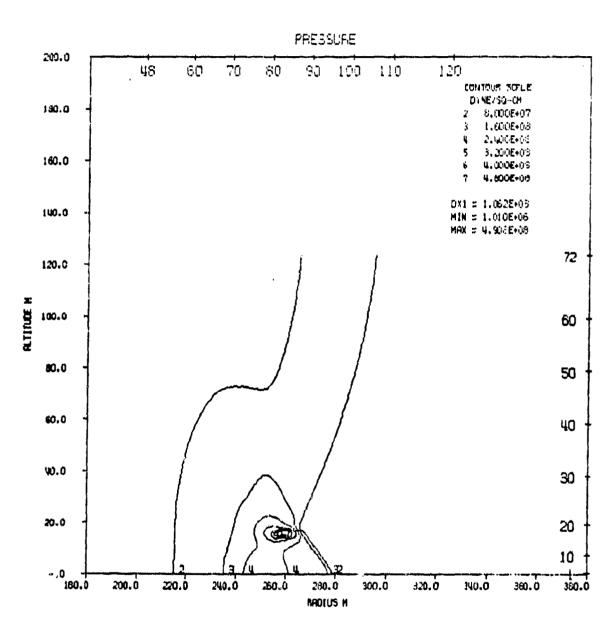


Figure 30. Pressure Contours for 1 MT at 500 Feet HOB, Ideal Case at 30 msec

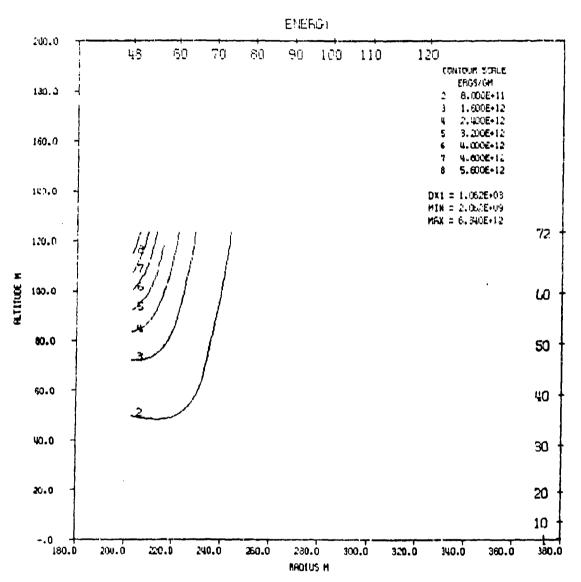


Figure 31. Energy Contours for 1 MT at 500 Feet HOB. Ideal Case at 30 msec

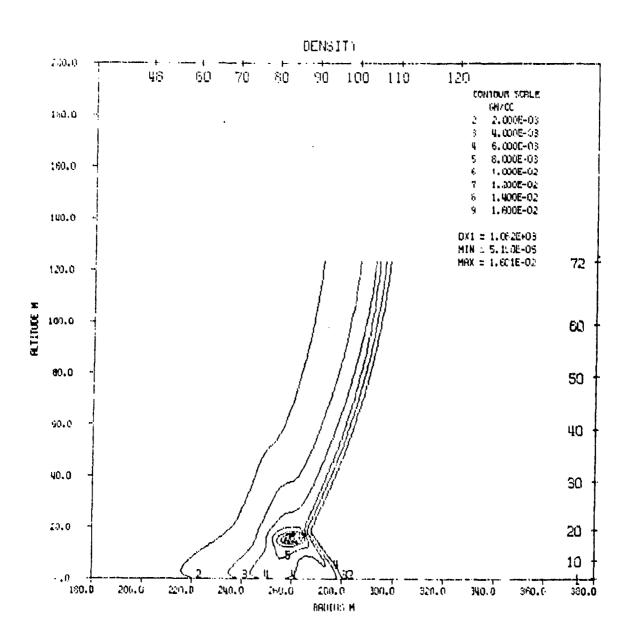


Figure 32. Density Contours for 1 MT at 500 Feet HOB, Ideal Case at 30 msec

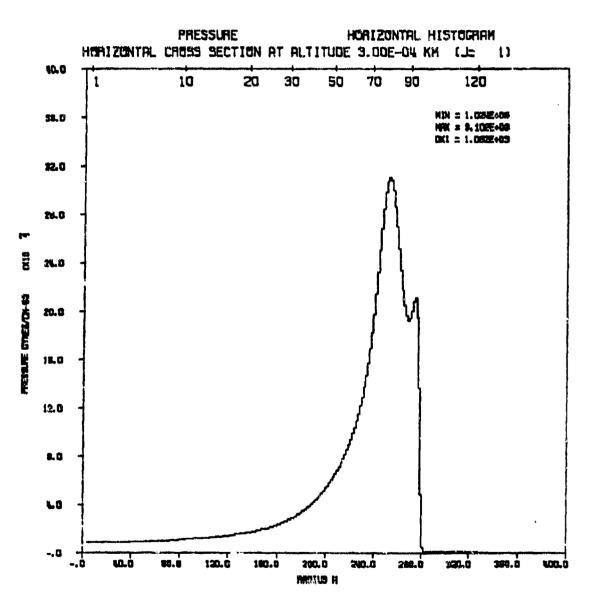


Figure 33a. Horizontal Pressure Histogram at 30 cm Altitude for 1 MT at 600 Feet HOB, Ideal Case at 30 msec

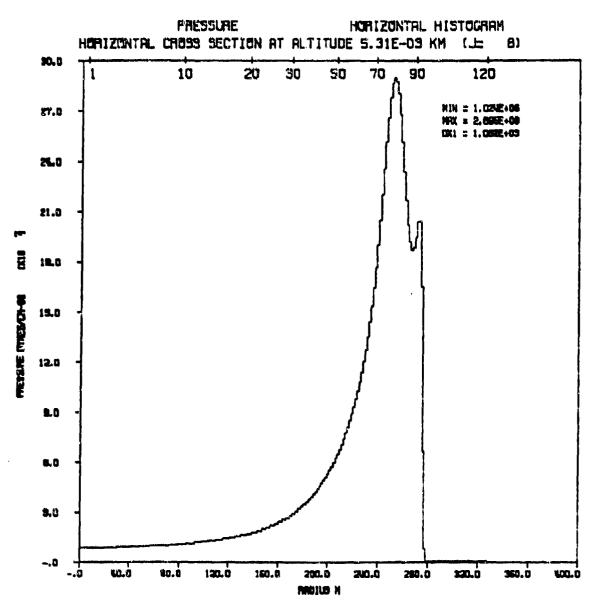


Figure 33b. Horizontal Pressure Histogram at 531 cm Altitude for 1 MT at 500 Feet HOB, Ideal Case at 30 msec

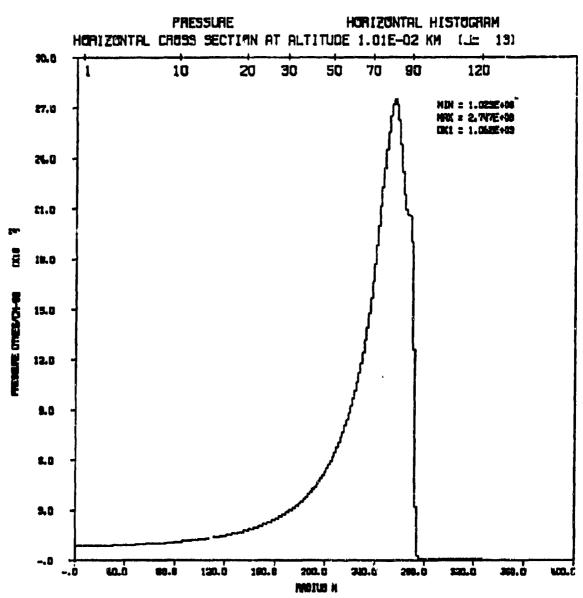


Figure 33c. Horizontal Pressure Histogram at 10.1 Meters Altitude for 1 MT at 500 Feet HOB, Ideal Case at 30 msec

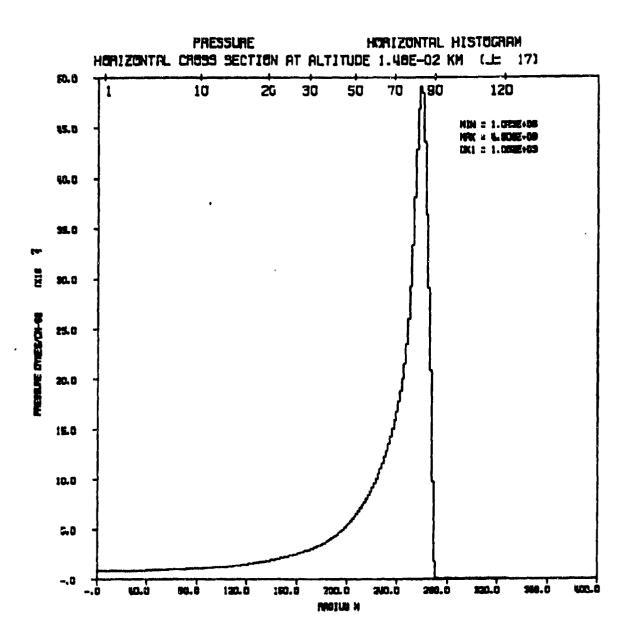


Figure 33d. Horizontal Pressure Histogram at 14.8 Meters Altitude for 1 MT at 500 Feet HOB, Ideal Case at 30 msec

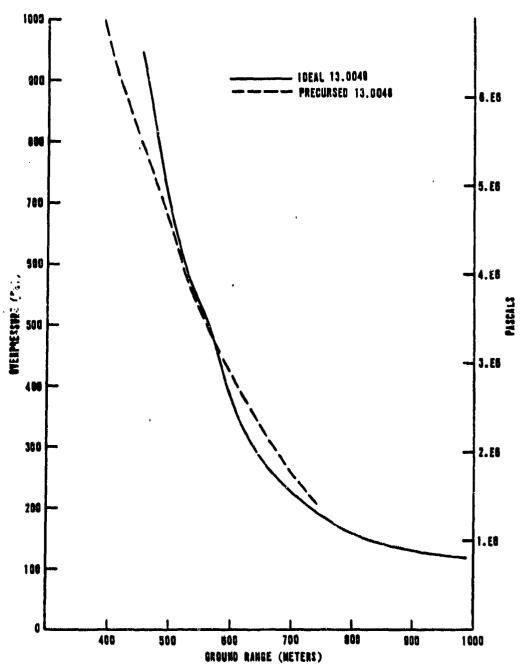


Figure 34a. Peak Overpressure versus Range for 500 Feet HOB Ideal and Precursed Cases

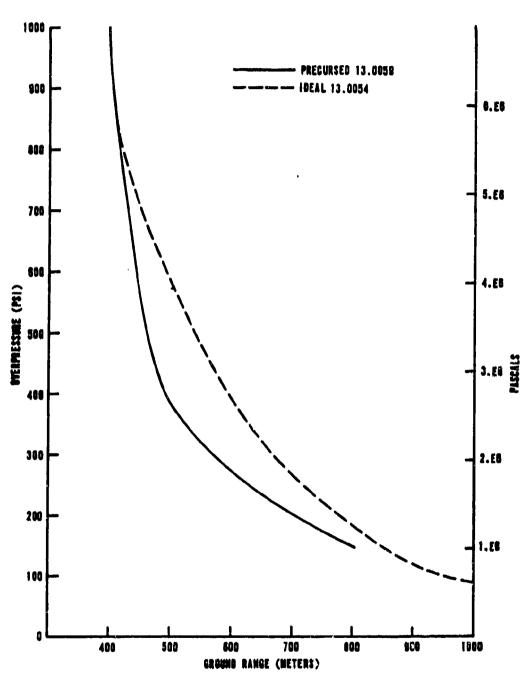


Figure 34b. Peak Overpressure versus Range for 750 Feet HOB Ideal and Precursed Cases

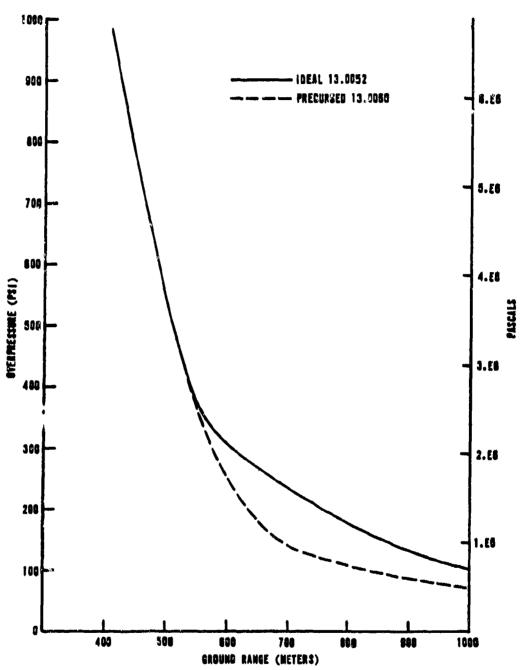


Figure 34c. Peak Overpressure versus Range for 1000 Feet HOB Ideal and Precursed Cases

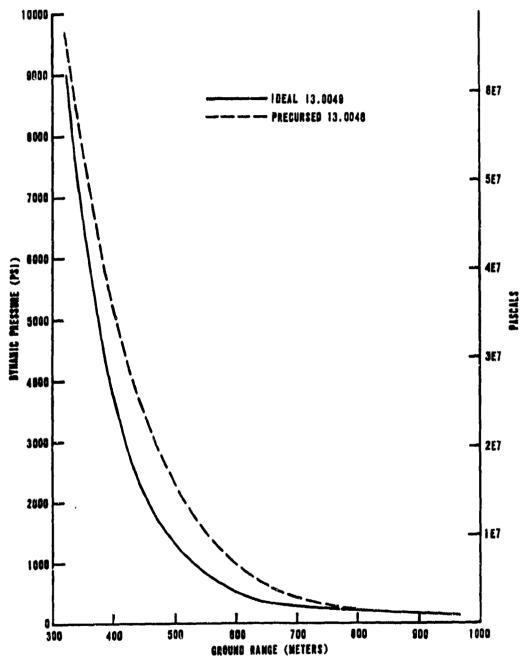


Figure 35a. Dynamic Pressure versus Range for 500 Feet HOB Ideal and Precursed Cases

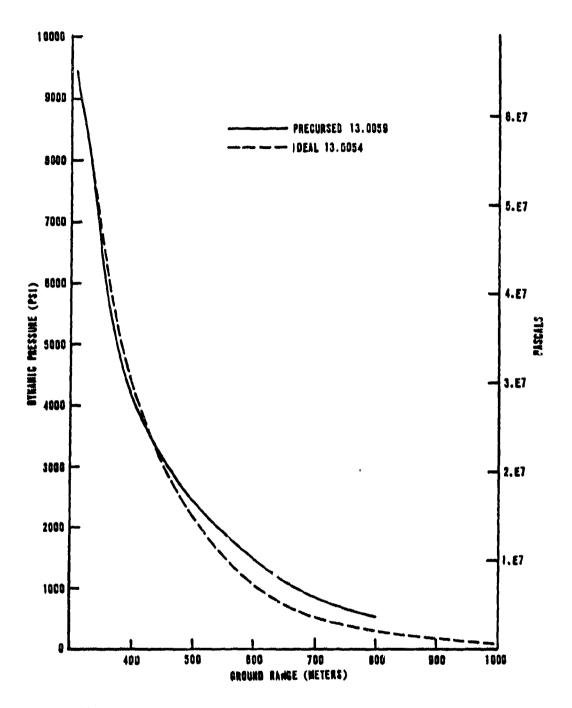


Figure 35b. Dynamic Pressure versus Range for 750 Feet HOB Ideal and Precursed Cases

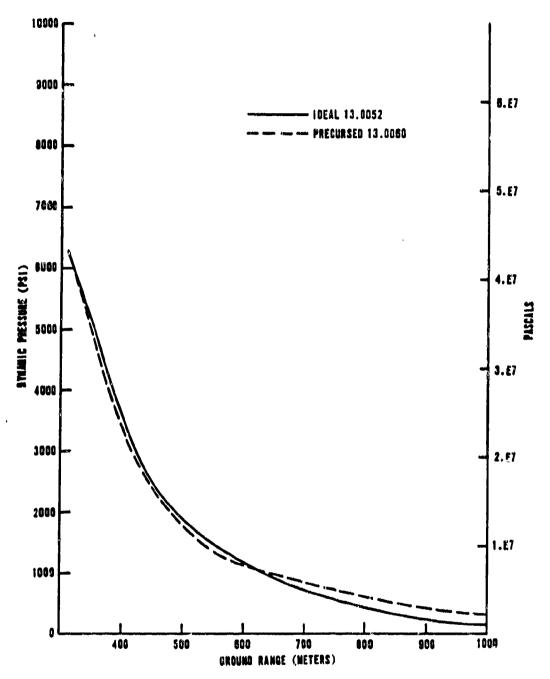


Figure 35c. Dynamic Pressure versus Range for 1000 Feet HOB Ideal and Precursed Cases

The dynamic pressures show a similar effect from the HOB. In all cases the peaks are enhanced because of the heated layer. One important thing to remember in interpreting these curves is that an HOB effect is also seen. That is, the range of some peak overpressure is dependent upon the HOB. For this reason, the pressure distance curves are displaced from one another.

#### SECTION VI

#### CONCLUSIONS

The heated layer along the ground can have significant effects upon the airblast that results from a nuclear explosion. Using the empirical thermal layer model developed from NTS data, a height of burst study for both ideal and precursed airblast has been completed. The method for including the thermal layer interactively into the calculations has been developed for the HULL code.

The results from the 1-MT surface burst calculations show that the airblast is modified by the thermal layer starting at the 1000-psi level. The HOB study shows that there is an optimum ground range for the precursor as a function of HOB. Moreover, dramatic effects in the static and dynamic overpressures occur as a result. The study has also shown the existence of a hydrodynamic precursor which gives rise to the double peak phenomenon.

The existence of the double peaks in the ideal surface case has been noted by others. Carpenter (ref. 18) noticed double peak waveforms from High Explosive (HE) experiments designed to look at HOB effects. The airblast data from the HOB studies in Canada (ref. 19) also show a double peak effect. There is no reason to believe that nuclear explosions would not exhibit the same behavior. Attributing the cause of the double peaks to the development of a hydrodynamic precursor is a new conclusion which has been shown by this set of calculations.

The thermal layer calculations assume the validity of extrapolating the NTS sound speed data from kiloton to megaton phenomenology. To the extent that the model reflects physically significant features of the actual thermal layer along the ground, the calculations will adequately predict the response of the shock wave as it travels through the thermal layer. One should view the results presented here as trends, but not as absolutes.

#### REFERENCES

- Ganong, G., and Whitaker, W., <u>Nuclear Blast Precursor</u>, AFWL-TR-69-19, Air Force Weapons Laboratory, Kirtland Air Force Base, 5M, 1969.
- 2. Chambers, B., Thermal Layer Predictor, AFWL-TN-76-2, Air Force Weapons Laboratory, Kirtland Air Force Base, NM, 1976.
- 3. Chambers, B. et al., 1 MT Precursor Calculations, AFWL-TN-75-12, Air Force Weapons Laboratory, Kirtland Air Force Base, NII, 1975.
- 4. Prentice, J., and Ganong, G., A Thermal Layer Predictor Fit for 10 Kilotons at 500 Feet Height of Burst, AFWL-TR-76-251, Air Force Weapons Laboratory, Kirtland Air Force Base, NH, In press.
- 5. Ganong, G., Private Communication, 1977.
- 6. Inn, E. C. Y., <u>Air Temperature Measurements Over Several Surfaces</u>, Weapons Test Report 1142, 1952.
- Broida, T. R. et al., <u>Air Temperatures in the Vicinity of a Nuclear Detonation</u>, Weapons Test Report 542, U.S. Naval Radiological Detense Laboratory, San Francisco, CA, September 1952.
- 8. McLoughlin, R. C., Sound Velocity Changes Near the Ground in the Vicinity of an Atomic Explosion, Weapons Test Report 546, U.S. Naval Electronics Laboratory. San Diego, CA, March 1953.
- 9. McLoughlin, R. C., <u>Preshock Sound Velocities Near the Ground in the Vicinity of an Atomic Explosion</u>, Weapons Test Report 1104, U.S. Naval Electronics Laboratory, San Diego, CA, May 1955.
- McLoughlin, R. C., and Foushee, F. C., Sound Velocities Near the Ground in the Vicinity of an Atomic Explosion, Weapons Test Report 776, U.S. Naval Electronics Laboratory, San Diego, CA, January 1955.
- 11. Ganong, G., Private Cormunication.
- 12. Knasel, T. M., Private Communication, Science Applications Inc. Actean, VA.
- 13. fry, M. et al., <u>HULL Hydrodynamics Code</u>, AFWL-TR-76-183, Air Force Weapons Laboratory, Kirtland Air Force Base, NM, September 1976.
- 14. Benjamin, H., <u>SPUTTER Users Manual</u>, AFWL-TN-72-7, Air Force Weapons Laboratory, Kirtland Air Force Base, NM, 1972.
- 15. Clemens, R., and Ganong, S., Private Communication.
- 16. Sharp, A., A Thermal Source Model from SPUTTER Calculations, AFWL-TR-72-49, Air Force Weapons Laboratory, Kirtland Air Force Base, NM, March 1973.

## REFERENCES (cont'd)

- 17. Needham, C. et al., <u>Nuclear Blast Standard</u>, AFWL-TR-73-55, Air Force Weapons Laboratory, Kirtland Air Force Base, NM, April 1975.
- 18. Carpenter, J., <u>Height of Burst Effects at High Overpressures</u>. TRW 20453-6011-RU-00, Redondo Beach, CA, June 1974.
- 19. Reisler, R., et al., <u>Air Blast Data from Height of Burst Studies in Canada</u>, Volume I Bel 1950, USA Ballistic Research Laboratories, Aberdeen Proving Ground, MD, December 1976.

#### APPENDIX A

### AFWL HULL CALCULATION OF 1-MT, IDEAL CASE

Appendixes A and B contain the blast data for all the problems. The abbreviations are:

TIME time in seconds

DXPM radial zone size in meters in the zone of peak overpressure.

PMAX peak overpressure in pascals (i.e., newtons per square meter)

XPM range, in meters, of peak overpressure

DPMAX peak dynamic pressure in pascals

XDPM range, in meters, of the peak dynamic pressure

TPMAX peak total pressure in pascals

XTPM range, in meters, of the peak total pressure

Each time is followed by the blast data for the leading three local overpressure and dynamic pressure peaks. These abbreviations are:

PEAK local overpressure peak in pascals

XPEAK range, in meters, of local peak overpressure

DPPEAK local dynamic pressure peak in pascals

XDPEAK range, in meters, of the local peak dynamic; essure

The reader should be aware that the rezone routine caused some trouble with shock definition in three of the problems. In problems 1.3048 and 13.0049, the zone of maximum pressure increased from 5 meters to 9 meters between 0.13 sec and 0.14 sec, so the shock definition after 0.14 sec is poor. This same thing occurred on problem 13.0054 between 0.34 sec and 0.36 sec.

# AFWL HULL Calculation of 1 MT Surface Burst Ideal Case

PROBLEM NUMBER 13.0143
PRESSURE IN PASCALS DISTANCE IN METERS

						CODM	TPMAX	XTPM
TIME	DXPM	PMAX		XPM U	PMAX	277	1.116E+08	273.
.0184	2	1.013E+05		389. 1.11/	15054F	2136	1.1100.00	2.50
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, 0 •		O. YAX	0.	0+	NOM A V	VDDM	TPMAX	XTPM
TIME	DXPM	XA'		APR C	7F - 67	70F !!	1.151E+08	275.
-0190	2.	2.462.+07 XPEAK		275. 9.04	CODEAK	2130	101010 %0	
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( • •	1254				DMAY	Y DPM	TPMAX	XTPM
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1.4	1628+07	2.168E+02 1.977E+02	0.	0.				
, - ,						<b>XDPM</b>	TPMAX	XTPM
9	DXPM	XAMY		207 7 26	55 4 0 7	287.	9.019E+07	287.
.0210	2.	1.7546+07		OPPEAK	YDDFAK			
	DOAR	IPCAN		UPPEMIN	MOLE WILL			
} •	103E+07	2.039E+02 1.788E+02 PMAX	٧.	0.				
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1+	096E+07	2.009E+02 1.788E+02 PMAX	٥.	0.				
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TIME	DXPM	PMAX	•	XPM	DPMAX	<b>M</b> P/IX	TPMAX	XTPM
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•0230	PEAK	XPF AK		DPPEAK	XDPEAK			
•	21 8F 406	2043069.5	0.	0.				
7.	616E+07	4.542E+01	0.	0.				
TIME		DMA V		VOM	DPMAX	XDPM	TPMAX	XTPM
.0260	2.	1.862E+07		311, 5.56	2E+07	311.	7.424E+07	311•
*0200	PEAK	XPEAK		DPPEAK	XDPEAK			
٥.	797F + 06	2.670E+02	0.	0.				
9.	970E+06	2.670E+02 7.772E+01	Ċ.	0.				~ <b>TOM</b>
TIME					DPMAX	XDPM	TPMAX	XTPM
.0280	2.	1.745E+07		321. 5.03	5E+07	321.	6.780E+07	321.
	PEAK	XPEAK		DPPEAK	XDPEAK			
7.	AAGE . OA	2.690E+02	0 -	0.				
7.	666E+06	1.743E+02	0.	0.				

PROBLEM NUMBER 13.0143
PRESSURE IN PASCALS DISTANCE IN METERS

TIME	DXPM	PMAX		XPM DPMAX	XOPH	TPMAX	XTPM
.030n	2.	1.651E+07	,	329. 4.609E+07	329	6.260E+07	329.
-	PEAK	XPEAK		DPPEAK XDPEAK			-
7.3	046+06	1.788E+02	0.	0.			
4.8	83E+06	6.754E+01	0.	0 •			
TIME	DXPM	PMAX		XPM UPMAX 337. 4.218E+07	XDPM	TPMAX	XTPM
•0320	2.	1.550E+07		337. 4.218E+07	337	5.768E+07	337.
	PEAK	XPEAK		DPPEAK XDPEAK		• • • • • • • • • • • • • • • • • • • •	-
6.7	24E+06	2.095E+02	C.	0.			
TIME 0.		0.	Ö.	0.			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
.0340	2•	1.453E+07		345. 3.902E+07	345.	5.355E+07	345.
<del>-</del>	PEAK	XPEAK		345. 3.902E+07 DPPEAK XDPEAK	-		•
6.0	80E+06	2.490E+02	0.	0 •			
5.9	72E+06	1.646E+02	0.	0. 0. XPM DPMAX 353. 3.651E+07 DPPEAK XDPEAK			
TIME:	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
.036n	2.	1.361F+07		353. 3.651E+07	353.	5.012E+07	353.
	PEAK	XPEAK		DPPEAK XDPEAK			-
:3 7 7	100.00	117706.06	~ •				
5.2	05E+06	1.051E+02	0.	0.			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
.0380	2.	1.272F+07		361. 3.432E+07	361.	4.704E+07	361.
	PEAK	XPEAK		DPPEAK XDPEAK	• • • •		
4.70	65F+06	1.480E+02	0.	0.			
5.93	35E+06	7.095E+00	0.	0.			
TIME	DXPM	PMAX		XPM DPMAX 367. 3.201E+07	XDPM	TPMAX	XTPM
•0400	2.	1.197E+07		367. 3.201E+07	369.	4.384E+07	369.
	PEAK	XPEAK		DPPEAK XDPEAK	-	_	
4.8	71E+06	6.754E+ul	0.	0.			
4.94	46E+06	3.340E+01	0.	0•			
TIME	UXPM	PMAX		XPM DPMAX 375. 2.998E+07	XDPM	TPMAX	XTPM
-0420	2.	1.135E+07		375. 2.998E+07	375.	4.133E+07	375.
	PFAK	X P F A K		UDDEAK AUDEVR			
4.36	11E+06	1.077E+02	0.	0.			
4.30	36E+06	9.097E+01	0.	0•			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
<b>.</b> 0450	2.	1.050E+07		385. 2.717E+07 DPPEAK XDPEAK	385.	3.767E+07	385.
	PEAK	XPEAK		DPPEAK XDPEAK			
3.93	19E+06	2043L02.2	0.	0 •			
3.64	SE+06	2.207E+02 9.097E+01	0.	0•			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
•0480		9.80SE+06		395. 2.496E+07	395.	3.476E+07	395.
	PEAK	XPEAK		DPPEAK XDPEAK		-	
3.80	7E+06	S.668E+02	0.	0.			
3.25	1E+06	3.651E+01	0.	0•			

PROBLEM NUMBER PRESSURE IN PASCALS

13.0143 DISTANCE IN METERS

TIME	DXPM	PMAX		XPM DPMAX	XDPM TPMAX	XTPM
.050	1 Z.	9.361E+06		401. 2.375E+07	403. 3.304E+07	403.
	PEAK	XPEAK		DPPEAK XDPEAK		
	3.694E+06	2.970E+02 9.337E+00	٥.	0 •		
•	3.080E+06	9.337E+00	0.	0 •		
TIME	: DXPM	PMAX		XPM DPMAX	XDPM TPMAX	XTPM
.053	1 Z.	8.850E+06		411. 2.194E+07	411. 3.079E+07	411.
	PEAK	XPEAK		DPPEAK XDPEAK		
	3.517E+06	3.230E+02	0.	0 • 0 •		
_ ;	3.265E+06	1.377E+02	0.	0•		
TIME	DXPM	PMAX		XPM DPMAX 421. 2.056E+07	XDPM TPMAX	XTPM
.0560	) Z•	8.349E+06		421. 2.056E+07	421. 2.891E+07	421•
	PEAK	XPEAK		DPPEAK XDPEAK		
3	3.328E+06	3.410E+02	0.	0.		
	3.395E+06	1.237E+01	0.	0.		
TIME	DXPM	PMAX		XPM DPMAX 433. 1.877E+07	XDPM TPMAX	XTPM
.0600	2.	7.767E+06		433. 1.877E+07	433. 2.654E+07	433.
_	PEAK	XPEAK	_	DPPEAK XDPEAK		
3	11725 + 00	J.630E+02	0.	0.		
7145	1.1105.400	1.0156.05	0.	0.		
1146	. UAPM	7 22/E-66		XPM DPMAX 445. 1.692E+07	XUPM IPMAX	AIPM
.0646	) C.	(+234E + VO		945. 1.072E7U/	445. 2.4156.01	445.
_	75 AN	1 447E4A	•	DPPEAK XDPEAK		
6	7705.04	1.00/6 +02	٥.	0.		
TIME	DXPM	20401C40S	U •	VPM DBMAY	VODM TOMAY	VTDM
.0550	2.	7.1755+06		XPM DPMAX 447. 1.692E+07	447 2 4105407	447
• • • • • • • • • • • • • • • • • • • •	PFAK	XPF AK		OPPEAK XOPEAK	441. 5.4105.01	77.
9	- 745F + 06	1.8545-02	۸.	OFFERN ADFERN		
5	.750E+06	1.667F+02	0.	0.		
TIME	DXPM	PMAX	•	XPM DPMAX	YORM TOMAY	YTPM
.0700	2.	6.634E+06		XPM DPMAX 459. 1.529E+07	461 - 2 191F+07	461
	K	YPFAK		UDDEAK AUDEAK	4011 211712 01	40.1
2	.5044 .	3 058E+02	0.	0.		
,	.418E+	3 058E+02 4E+01	0.	0.		
TIME	DXPM	'4x		XPM DPMAX	XDPM TPMAX	XTPM
.0743	2.	6.260. 6		471. 1.407E+07 DPPEAK XDPEAK	471. 2.034E+07	471.
	PEAK	XPEAK		DPPFAK KOPFAK		
7	.374E+06	3.470E+02	0.	0•		
0	•	3.470E+02	0.	0.		
1 Tab	UXPM	PMAX		XPM DPMAX	XDPM TPMAX	XTPM
•0750	2.	6.203E+06		473. 1.388E+07	473. 2.009E+07	473.
	PEAK	XPEAK		DPPEAK XDPEAK		
2	•53AF . NO	J.790E+02 3.530E+02	0.	0•		
7	.351E+06	3.530E+02	0.	0•		

PROBLEM NUMBER
PRESSURE IN PASCALS

13.0143 DISTANCE IN METERS

TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
.0800	2.	5.769E+06		485. 1.254E+07	487.	1.827E+07	
	PEAK			DPPEAK XDPEAK	4011	110212101	4010
~ 3'		****	^				
		3.850E+02		= -			
2.22		3.810E+02	0.	0•			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX.	XTPM
.085.1	2.	5.382E+06		497. 1.142E+07	499.	1.680E+07	459.
	PEAK	XPEAK		DPPEAK XDPEAK	4,,,,		
- 11		4.030E+02	^				
				_			
		5.804E+01	0.	0			
TIME	DXPM	PMAX		XPM DPMAX		TPMAX	
•0900	2.	5.041E+06		509. 1.031E+07	509.	1.535E+07	509.
	PEAK	XPEAK		DPPCAK XDPEAK			
2.04	6E+06	4.230E+02	٥.	0.			
) AC	6F+06	3.5388+02	ñ.	0.			
TIME		PMAX	•	XPM DPMAX	V004	TPHAX	XTPM
				EDI O ALLEAA			
•0950	G+	4.1292100		521. 9.411E+06 DPPEAK XDPEAK	251.	1.414E+07	521•
1.97	6E+06	4.410E+02	0.	0•			
1.80	90+3S	3.729E+02	0.	0•			
TIME	DXPM	PMAX		XPM DPMAX	XOPM	XAM 4T	XTPM
•100n	2.			533. 8.505E+06		1.292E+07	
• • • • • • • • • • • • • • • • • • • •	PEAK	XPEAK		OPPEAK XOPEAK	3334	115725.01	3331
. 70				_			
		4.089E+02		0•			
		3.754E+02	0.	0•			
TIME		PMAX		XPM DPMAX	XDPM		
-1100	2.	3.872E+06		553. 7.024E+06	553.	1.090E+07	553.
	PEAK	XPEAK		OPPEAK XDPEAK			
1.50	7E+06	2.142E+02	0.	0.			
		1.442E+02		0.			
TIME	DXPM	PHAX	••	and the second s	<b>400</b> 4	TOMAN	. Thu
				XPM DPMAX		TPMAX	XTPM
•120n		3.410E+06			573.	9.234E+06	573.
	PEAK	XPEAK		OPPEAK XOPEAK			
1.37	3E+06	3.766E+02	0.	0•			
1.37	1E+06	3.295E+02	0.	0.			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
-1220		3.326E+06		577. 5.630E+06		8.954E+06	575.
*****	PEAK	XPEAK		DPPEAK XDPEAK	3130	017345.00	3.34
, 24							
		3.943E+02		0.			
• -		J.829E+02		0.			
TIME	DXPM	PMAX		XPM DPMAX		TPMAX	XTPM
·1300		3.040E+06		591. 4.930E+06	591.	7.970E+06	591•
	PEAK	XPEAK		DPPEAK XOPEAK			
1.26	8E+06	4.184E+02	0.	0.			
		3.839E+02		0.			
, ,			~ ~	<b>~</b> ~			

PROBLEM NUMBER
PRESSURE IN PASCALS

13.0143 DISTANCE IN METERS

TIME	DXPM	PMAX		XPM	DPMAX	YDDM	TPMAX	XTPM
• 1400	2.	2.735E+06			.221E+06		6.956E+06	
• 140ú	PEAK	XPEAK			XDPEAK	(10 ) 6	017502-00	
. 10	7 L AA	4-5746-02	۸.	O' ' CAN	0.			
1.14	0E + 06	4.534E+02 4.028E+02	٥.		0.			
TIME		PMAX	•	XPM		KOPM	TPMAX	XTPM
• 150n		2.480£+06			682E+06	625.	6-159E+06	
*****	PEAK			OPPEAK	XDPEAK	••••	0404	
1.08	0E+06	4.463E+02	٥.		0.			
1.06	7E+06	3.906E+02	0 .		0.			
TIME		PMAX		XPM	DPMAX	XDPM	TPMAX	XTPM
.1600	2.			643. 3.	252E+06	641.	5.515E+06	641.
	PEAK	XPEAK		OPPEAK	252E+06 XOPEAK	-		
9.99	9E+05	4.505E+02	0.		0.			
9.96	7E+05	4.368E+02	0.		0.			
TIME	DXPM	PMAX		XPM	DPHAX	XDPM	TPMAX	
-1700	2.	2.1015+06		659. 2.	911E+06 XDPEAK	657.	5.005E+06	659.
	PEAK	XPEAK		DPPEAK	XDPEAK			
		6.670E+02			0 6			
		4.747E+02	Q.		0.			
TIME	DXPM	PMAX		XPM	DPMAX		TPMAX	
.1800	2.	1.958E+06		675. 2.	641E+06	673.	4.593E+06	675.
	PEAK	XPEAK			XDPEAK			
1.92	4E+06	6.830E+02	0.		0.			
		4.799E+02		~ m.	0.	UBBM	TPMAX	VTDM
TIME	DXPM	PMAX		XPM	DPMAX		4.259E+06	
·190n		XPEAK			424E+06	007+	**5346.00	971
		6.970E+02			O.			
		4.90BE+02			0.			
TIME		PMAX		XPM		YORM	TPMAX	XTPM
.2000	2	1 - 740F+06		707. 2.	252F+06	705.	3.988E+06	705.
10031	PEAK				XDPEAK		317002 00	, , , , ,
1.73		7.130E+02		J. I CALL	0.			
		4.929E-02			0.			
TIME	DXPM	PMAX	••	XPM		XDPM	TPMAX	XTPM
.2100	2.	1.662E+06		727. 2.	DPMAX 115E+06	721.	3.770E+06	721.
	PEAK	XPEAK		OPPEAK	XDPEAK		- · ·	
1.65	5E+06	7.210E+02 4.946E+02	0.		0.			
7.31	4E+05				0.			
TIME	DXPM	PMAX		XPM	DPMAX 995E+06		TPMAX	
.220A	2.	1.581E+06				737.	3.571E+06	737.
		XPEAK		DPPEAK				
		7.370E+02	1.9	983E+06	7.410E+02			
4.93	4E+05	5.066E+02	0.		0.			

PROBLEM NUMBER 13.0143
PRESSURE IN PASCALS DISTANCE IN METERS

TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
-2300	2.	1.525E+06					
-230(1						3.425E+06	749.
	PEAK	• • • • • • • • • • • • • • • • • • • •		DPPEAK XDPE	AK		
1	.516E+06	7.490E+02	0.	0•			
6	.643E+05	5.102E+02	0.	Ŏ•			
TIME				XPM DPMAX	XDPM	TPMAX	XTPM
-2500				781. 1.755E+06	,,		
-230(1						3.170E+06	781.
_	PEAK	,		DPPEAK XOPE	AK		
		5.1925+02		0•			
5	.905E+05	4.662E+02	0.	0•			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
-2600	2.	1 - 366E+06		793. 1.694E+06	**-		
		XPEAK				3.060E+06	793.
_			_		An		
		5.274E+02		0•			
		4.862E+02	0.	0•			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
.2800	2.	1.278E+06		819. 1.570E+06	• • • • • • • • • • • • • • • • • • • •	2.844E+06	
• •	PEAK	XPEAK		DPPEAK XDPE		210445100	0114
=		5.572E+02	^		AD		
				0.			
		5.326E+02	Q .	0•			
TIME		PHAX		XPM DPMAX	XDPM	TPMAX	XTPM
-3000	2.	1.200E+C5		843. 1.461E+06	841.	2.657E+06	841.
,	PEAK	XPEAK		OPPEAK XDPE		2100.2.00	5414
4.		5.362E+02	Λ.		A.		
				0•			
4 (	0745703	5.034E.02	U.	0•			

PROBLEM NUMBER 13.0049
PRESSURE IN PASCALS DISTANCE IN HETERS

				*****			~~~
TIME	DXPM	PMAX -1.013E+05	XPM	DPMAX		TPHAX	
.0047		-1.0135.03	DPPEAK	-24 (F-04	1.	0.	0.
	PEAK						
0	•	0.	0.3125-05	9.335E-05			
O TIME	* NYBM	XAM9	XPM	NAMAY	V DDM	TPHAX	YTOM
.0042	2.	1.127F+A7	210. 5	.598E-04		1.123E+03	
••••	PFAK	1 • 123E • 03 XPEAK	DPDFAK	XDPEAK	510	111525.03	2374
-2				9.066E-05			
0	•	0.		9.588E-05			
TIME			XPM	DPMAX	XDPM	TPMAX	XTPM
.0043	2.	1.123E+03	239. 2	.492E-03 XDPEAK	157.	1.123E+03	239.
	PEAK	XPEAK	DPPEAK	XOPEAK	-		
				5.560E-04			
***	.590E+01	2.100E+01	5.560E-04	5.000E+00			
TIME	DAPM	PMAX	XPM	DPMAX	XDPM	TPMAX	XTPM
.0045	.s	1 • 123E + 03	239. 9	DPMAX -555E-03	157.	1.123E+03	239.
_	FEAN	AFEAN	UPPEAR	AUPEAN			
<b>~</b> ≥,	860E+02	1.370E+02	0.				
TIME	TUFS10F	2.100E+01	U. YOM	0.	* OOH	TPMAX	KTOM
+ J048	7. VAPE	1.127E+02	220. 2	3785-A2	XUPH	1-127FAA2	276
13978	PEAK	TOPAK	DDDFAK	DPMAX .338E-02 XOPEAK	1010	1.1526-03	2374
-2.	135F+01	3.000E+00	A.	0.			
- 7		0.		0.			
TANT	DXPM	PMAX	XPM	DPMAX	XDPM	TPMAX	XTPM
.005^	2.	1.123E+03	239. 5	DPMAX .676E-02	157.	1.123E+03	239.
• • • •	PEAK	XPEAK	DPPEAK	XDPEAK	•		
-,,	842E+01	3.000E+00					
0 •	,	0.	0.	0.			
TIME	DXPM	PMAX	XPM	DPMAX •094E+06	XDPM	TPMAX	XTPM
.0053	2.	2.596F+06	3. 5	.094E+06	3.	4.691E+06	3•
				XDPEAK			
0.		0.	0.	0.			
() •		0.	0.	0.	×884	TOMAN	UTOM
TIME •0055	UAPH	1 9305403	XPM	DPMAX -329E+08	XUPH	TPMAX	l.
•4025	PEAK	1.0%UC+UO	DDDSAK	XDPEAK	1.	0.1475.00	1.
0.		0.	O.	O.			
0.		0.	0.	0.			
TIME					XOPM	TPMAX	XTPM
.0056	2.	PMAX 3.914F+08	1. 5.	DPMAX 653E+08	7.	9.514E+08	1.
	PEAK				. •		• •
0.		0.	5.600E+08	1.000E+00			
n.		0.	0.	0.			

PROBLEM NUMBER
PRESSURE IN PASCALS

13.0049
DI TANCE IN METERS

				V 2014			
TIME	UXPM	PMAX		XPM DE 7. 5.5666 DPPEAK X	MAX XUPH	TPMAX	XTPM
.0060	25.4	1.0146.04	,	7. 5.500	.+08 33.	1.0405.04	27.
_	PEAR	APEAR		UPPEAR ;	COPEAR		
94	7746+08	1.3005.01	0.	0. XPM DF 39. 5.793E DPPEAK )		•	
7745	, DYDM	V.	v.	VDM O	MAY 4004	TOMAN	v TOM
•0065	שאאט	7 MAA		30 5 7035	MAX XUPH	IPMAX	XIPH
•0005	254	140515707		174 34/7JC	. TUO 31.	1.5125-03	43.
	AZGE AGG	7 444E44	^	UPPEAR )	UPEAN		
4.	-30E+00	3.4006.400	00	0.			
TIME	UADM	DMAV	V •	VDM VO	MAV UMDM	TOMAY	VTOM
-0074	UAFM	1.0125.00		57. 4.931E	'HAA AUFH	1.7405400	AIPM ED
• • • • •	DEAK	VDEAY		UDDEAK A		1.2005-03	370
Λ.	FEAN	AFEAN	۸.	DPPEAR A	OPEAN		
0.0	1	0.	٥.	0.			
TIME	DXPM	PMAX	••	XPM DE	MAY YOPM	TOMAY	X TOM
0075	2.	9.324E+08		69. 6.452F	+08 75.	1.394F+09	71.
	PEAK	XPEAK		DPPFAK X	DPFAK	113746.07	
٥.	983E+07	1.000E+00	٥.	0,, 5,,,	O' CAN		
0.0		0.	Õ.	0.			
TIME	DXPM	PMAX	•••	XPM DP	MAX XDPM	TPMAX	XTPM
.0080	2.	8.264E+08		81. 6.195E	+08 85.	1.345E+09	81.
	PEAK	XPEAK		DPPEAK X	DPEAK		•••
0.		0.	0.	0.			
ñ.		0.	0.	0.			
TIME	DXPH	PMAX		XPM DP	MAX XDPH	TPMAX	XTPM
.0085	2.	7.204E+08		91. 6.019E	+06 93.	1.281E+09	91.
	PEAK	XPEAK		DPPEAK X	DPEAK		
0.		0.	0.	0•			
0 •		0.	٥.	0.			
TIME	DXPM	PMAX		XPM DP	MAX XDPM	TPMAX	XTPM
-0090	2.	6.245E+08		99. 5.8B4E	•08 101 <b>.</b>	1.167E+09	89.
	PEAK	XPEAK	_	DPPEAK X	DPEAK		
0 •		0.	0.	0.			
0 •	5454	0.	0.	0.		==	
IIME	DXPM	PMAX		XPM OP	MAX XDPM	TPMAX	XTPM
•0095	2.	5.4436+08		107. 5.65/6	•08 109 <b>.</b>	1.0876+09	107.
_	PEAR	APEAK	_	UPPEAK X	DPEAK		
7.		0.	V.	0•			
7 T ME	CABM	DMAN	٠.	VOM 00	MAN 4554	-	M <b>20 2</b> 1 4 4
ያማል! ለስስላ	UAPM	アアスス		115 6 5005	MUNA XUPM	TPMAX	X (PM
• A Y A ()	DEAM	TO 113ETUS	•	7130 3020AC	.AC 113.	1.0505.403	112.
^	FEAN	APEAR	^	39. 5.793E DPPEAK	UPEAR		
ij <b>•</b>		<b>0</b> •	<b>v</b> •	0.			
17.0		V •	V.	U•			

PROBLEM NUMBER 13.0049
PRESSURE IN PASCALS DISTANCE IN METERS

T 7 M	0.424	5414			_		
TIME	DXPM	*		XPH DPHAX	XDPM	TPMAX	XTPH
-0110				127. 4.894E+08		523E+08	127.
	PEAK	XPEAK		DPPEAK XDPEAK			
0 •		0.	٥.	0.			
0.		0.	0.	0.			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
-0120	2.	2.836E+08		139. 4.824E+08	139. 7.	659E+08	139.
	PEAK	XPEAK		DPPEAK XDPEAK	••••		
0 •		0.	0.				
0.		0.	0.	* *			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAY	XTPM
-0130	2.	2.241E+08		149. 4.639E+08	149. 6.8	BANEANA	140
	PEAK	XPEAK		DPPEAK XDPEAK	1474 616	9045 400	1470
0.		0.		0.			
Ů.		0.	0.	ŏ.			
TIME	DXPM			XPM DPMAX	XDPH	TOMAY	V 764
-0140				157. 4.400E.08	157 4 1	IPMAA	XTPM
	PEAK	XPEAK		DPPEAK XOPEAK	124. 0.3	075 - 00	157.
0 •		0.	0.				
0.		0.	0.	0 • 0 •			
TIME	DXPM	DMAY	•	XPM DPMAX	MADM	<b></b>	u = #1.4
-0150	2.	PMAX 1-610E+08 XPEAK		16E / DEDELAG	XDPH	IPMAX	XTPM
****	DEAK	TOTOLOG		165. 4.258E+08	10/. 5./	135+08	165.
Α.		O.	٥.				
0 •				0.			
TIME	DXPM	0.	0.	0.			
•0151		PMAX		XPM DPMAX	XDPM		XTPM
•0121				165. 4.240E+08	167. 5.7	69E+08	167.
•	PEAK		_	DPPEAK XDPEAK			
0 •			0.	٥٠			
۸.			0.	0.			
TIME	DXPM	PMAX		XPH DPHAX	XDPM		MYTX
-0160	10 1	1.3685.108		172. 4.185E+08	175. 5.4	37E+08	175.
	PEAK			DPPEAK XDPEAK			
<u>0</u> •			0.	0•			
0 •	-		0.	_ 0•			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
<b>-017</b> 0		.213E+08		180. 3.930E+08	182. 5.00	65E+08	182.
	PEAK	VLENU		DPPEAK XDPEAK	•		
0 •	_		0.	0•			
<u> </u>	-	•	0.	0.			
TIME	DXPM			XPM DPMAX	XDPM	TPMAX	XTPM
-0180		•059E+08		187. 3.598E+08	190. 4.50		189.
	PEAK	XPEAK		DPPEAK XDPEAK		- " • •	• • • •
0 •			0.	0•			
0.	Û		٠.	0.			

13.0049 Distance in Meters

TIME								
TIME DXPM PMAX XPM DPMAX XOPM TPMAX XTPM DPM	TIME	DXPH	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
TIME DXPM PMAX XPM DPMAX XOPM TPMAX XTPM DPM	.0190	1.	9.357E+07		193. 3.260E+08	196.	4.098E+08	196.
TIME		PEAK	RIPEAR	_	OPPEAR XDPEAR			
TIME			0.	0.	0.			
-0200 1. 6.262F+07	7745	D V D M	Q.	V •	0.	- ABM	TOMA W	V 40M
O.		UAPM	PMAA G George		100 0 0345+00	AUPH	1 CARAR	207
O.	-0200	DE AM	0+202F. TU /		1704 %.734C7U0	203.	7.0405-00	£01•
TIME DXPM PMAX XPEAK DPMAX XDPM TPMAX XTPM DPMAX XDPAK XDPEAK XDP	_		AFEAR		UPPEAR AUPEAR			
TIME DXPM PMAX				0.	0.			
0210 1. 7.390E+07 206. 2.673E+08 209. 3.313E+08 209.  0. 0. 0. 0. 0. 0.  TIME DXPM PHAX XPEAK DPPEAK XDPEAK XDPMAX XTPM 216. 2.20ZE+08 221. 2.715E+08 221.  0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0		UABM	DHAY	٠.	YOM DOMAY	YDDM	TOMAY	YTOM
O		1.	7. 390F+07		206. 2.673F+08	200	3.313F+08	500.
O	-0210	PEAK	XPEAK		DPPFAK XDPFAK	2070	313132.00	4.47
TIME DXPM PMAX XPEAK DPPEAK XDPEAK XDPH TPMAX XTPM DPMAX XDPM TPMAX XTPM Z26. 2.23. 2.22. 2.715 = 0.8 221. 2	٨.		0.	0.	0.			
TIME DXPM PMAX 216 2.202E+08 221 2.715E+08 2	۸.		۸	0.	0.			
-0230	TIME	DXPM	PMAX	-•	XPH DPMAX	MGOX	TPMAX	XTPM
11ME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM DPMAX XDPAK Z355E+07 2,492E+02 0. 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM DPMAX XDPAK XD	.0230	2.	5.980E+07		216. 2.202E+08	221.	2.715E+08	551•
11ME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM DPMAX XDPAK Z355E+07 2,492E+02 0. 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM DPMAX XDPAK XD		PEAK	XPEAK		DPPEAK XDPEAK			
TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM 2250 2.4.828E+07 228.1.814E+08 233.2.222E+08 231.  PEAK XPEAK DPPEAK XDPEAK XDPAX XOPM TPMAX XTPM 0260 2.4.413E+07 233.1.659E+08 239.2.032E+08 237.  PEAK XPEAK DPPEAK XDPEAK XDPEAK 2.355E+07 2.492E+02 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.			0.	0.	0.			
-0250	۸.		0.	0.	0 •			
7.436E+07 2.432E+02 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	TIME	DXPM	PMAX		XPM DPMAX	XOPH	TPHAX	XTPM
7.436E+07 2.432E+02 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	-0250	2•	4.828E+07		228. 1.814E+08	233.	80+3222·3	231.
TIME DXPM PMAX XPM DPMAX XOPM TPMAX XTPM .0260		PEAK	XPEAK	_	DPPEAK XDPEAK			
-0260		436E+07	2.432E+02	0.	0.			
-0260		5 × 5	0.	0.	0.			H # 6M
2.355E+07 2.492E+02 0. 0. 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0280 2.3.681E+07 243.1.387E+08 249.1.693E+08 249.		DXPM	- 一 ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・ ・		APM DPMAX	XUPM	1PMAX	XIPM
2.355E+07 2.492E+02 0. 0. 0.  O. 0. 0. 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0280 2. 3.681E+07 243. 1.387E+08 249. 1.693E+08 249.  PEAK XPEAK DPPEAK XDPEAK  2.204E+07 2.618E+02 0. 0.  O. 0. 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0300 2. 3.092E+07 252. 1.168E+08 260. 1.422E+08 259.  PEAK XPEAK DPPEAK XDPEAK  2.093E+07 2.745E+02 0. 0.  O. 0. 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0320 2. 2.610E+07 262. 9.928E+07 271. 1.204E+08 270.  PEAK XPEAK DPPEAK XDPEAK  1.980E+07 2.856E+02 9.770E+07 2.808E+02	•0500	20	4.4175.40		577. 1.05AF.40	514.	2.0326.00	£31•
TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM 243. 1.387E+08 249. 1.693E+08 249. PEAK XPEAK DPPEAK XDPEAK 2.204E+07 2.618E+02 0. 0. 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0300 2. 3.092E+07 252. 1.168E+08 260. 1.422E+08 259. PEAK XPEAK DPPEAK XDPEAK 2.093E+07 2.745E+02 0. 0. 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0320 2. 2.610E+07 262. 9.928E+07 271. 1.204E+08 270. PEAK XPEAK DPPEAK XDPEAK 1.980E+07 2.856E+02 9.770E+07 2.808E+02	•							
-0280			60476ETUC	۷.	ÿ•			
-0280			DHAY	٠.	VOM COMAY	VNOM	TOMAY	YTOM
PEAK XPEAK OPPEAK XDPEAK 2.204E+07 2.618E+02 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.		2.	3.681F407		263. 1.387F+08			
2.204E+07 2.618E+02 0.	• 02.00	PFAK	YPF AK		OPPEAK XOPEAK	6474	110125-00	F-4.4
7. 0. 0. 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0300 2. 3.092E+07 252. 1.168E+08 260. 1.422E+08 259. PEAK XPEAK DPPEAK XDPEAK .093E+07 2.745E+02 0. 0. 0. 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0320 2. 2.610E+07 262. 9.928E+07 271. 1.204E+08 270. PEAK XPEAK DPPEAK XDPEAK 1.980E+07 2.856E+02 9.770E+07 2.808E+02	2.							
-0300 2. 3.092E+07 252. 1.168E+08 260. 1.422E+08 259. PEAK XPEAK DPPEAK XDPEAK P.093E+07 2.745E+02 0. 0.  O. 0. 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  -0320 2. 2.610E+07 262. 9.928E+07 271. 1.204E+08 270.  PEAK XPEAK DPPEAK XDPEAK 1.980E+07 2.856E+02 9.770E+07 2.808E+02			0.	0.	0.			
-0300 2. 3.092E+07 252. 1.168E+08 260. 1.422E+08 259. PEAK XPEAK DPPEAK XDPEAK P.093E+07 2.745E+02 0. 0.  O. 0. 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  -0320 2. 2.610E+07 262. 9.928E+07 271. 1.204E+08 270.  PEAK XPEAK DPPEAK XDPEAK 1.980E+07 2.856E+02 9.770E+07 2.808E+02			PHAX	••	XPM DPMAX	XDPM	TPMAX	XTPH
PEAK XPEAK DPPEAK XDPEAK 2.093E+07 2.745E+02 0. 0. 0. 0. 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0320 2.2.610E+07 262.9,928E+07 271.1.204E+08 270. PEAK XPEAK DPPEAK XDPEAK 1.980E+07 2.856E+02 9.770E+07 2.808E+02			3.092E+07		252. 1.168E+08	260.	1.422E+08	259.
P.093E+07 2.745E+02 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.		PEAK	XPEAK		DPPEAK XDPEAK	• • • •	• • • • • • • • • • • • • • • • • • • •	
n. 0. 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0320 2.2.610E+07 262.9,928E+07 271.1.204E+08 270. PEAK XPEAK DPPEAK XDPEAK 1.980E+07 2.856E+02 9.770E+07 2.808E+02	٥, ٩		2.745E+02	0.	0.			
-0320 2. 2.610E+C7 262. 9.92BE+O7 271. 1.204E+O8 270. PEAK XPEAK DPPEAK XDPEAK 1.980E+O7 2.856E+O2 9.770E+O7 2.808E+C2	n.		0.	0.	0.			
PEAK XPEAK DPPEAK XDPEAK 1.980E+07 2.856E+02 9.770E+07 2.808E+02		DXPM	PMAX		XPM DPMAX			
1.980E+07 2.856E+02 9.770E+07 2.808E+02	.0320					271.	1.2046+08	270.
1.980E+07 2.856E+02 9.770E+07 2.808E+02 0.								
0. 0. 0.	1.5	980E+07	2.856E+02	9.7	70E+07 2.808E+02			
	0 •		0.	0.	0.			

PROBLEM NUMBER
PRESSURE IN PASCALS

13.0049 DISYANCE IN METERS

TIM	E DXPM	2.223E+07	XPM	DPHAX	XDPM	TPHAX	XTPM
.034	0 2.	2.223E+07	270. 8	.721E+07	293.	1.045E+08	294.
	PEAR	( XPEAK	DPPEAK	XDPFAK	2.00		
	1.829E+07	2.960E+02	)_	0.			
	Λ.	2.960E+02	<b>.</b>	0.			
TIM	E DXPM	DMAY	, ADM	VDW 4 A	w ( 143 ha	TOMA	u 40M
.036	r. UAPP	PMAX 1.922E+07	270 7	UPMAX TEAE-AT	XUFM	1 PMAX	XIPH
•020	0 20	1.9826.401	2/9. /	./34E+0/	305.	9.437E+07	305+
	PEAK	XPEAK	DPPEAK	XDPEAK			
	1.736E+07	3.065E*02 (	•	0 •			
	<b>0</b> •	3.065E 02 (	١.	0.			
TIM	E DXPM	I PMAX	XPM	DPMAX	XDPM	TPMAX	XTPM
.038	0 2.	1.6815+07	287. 6	958E+07	315.	8.567E+07	315.
	PEAK	1.681E+07 XPEAK	DPPEAK	XDPEAK	• • • •		
	1.643E+07	3-170E+02 (		0.			
	0.	0.		0.			
	E DXPM	PMAX	XPM	DDKAY	VODM	TPMAY	YTDM
.040						7.691E+07	
*040		1-505F+07	7670 6	100CAP	2520	1.0215.01	323.
	PEAN Pean	XPEAK	UPPEAR				
	] • • / 46 • 0 /	2.945E+02 (	•	0.			
	() •	O. PMAX		0.			_
	E DXPM	PMAX	XPM	DPMAX	XDPM	TPMAX	
-042	0 2.	1.392E+07	335. 5.	526E+07	333.	6.877E+07	333.
		XPEAK					
,	1.319E+07	3.026E.05 0	•	0.			
	1.	0. 0	•	0.			
TIM	DXPM	PMAX	XPM	DPMAX	XDPM	TPMAX	XTPM
.045	2.	1.312E+07	349. 4.	769E+07	347.	6.040E+07	347.
	PEAK	XPFAK	DPPFAK	XOPEAK	• • • •		
•	-127E+07	3.147E+02 0 7.447E+01 0 PMAX 1.209E+07	•	0-			
	415F+06	7-447E+01 0	•	0.			
TIME	DXPM	DMAY	VOM	DDMAY	"DDM	TMMAU	v = 614
.048	. טארת	1 2005-07	262 /	DEMAK 1245 a 67	AUPM	TPMAX	AIPH
* 0701	PEAK	1.5075.01	303. 4.	1345401	301.	5.332E+07	361.
_			DPPEAK	XDPEAK			
9	* 105F + 00	3.244E+02 0 9.928E+01 0 PMAX	•	0.			
1	•776E+06	9.928E+01 0	•	0.			
	DXPM	PMAX	XPH	DPMAX	XDPM	TPMAX	XTPH
-0500	2.	PMAX 1.145E+07	371. 3.	755E+07	369.	4.883E+07	369.
	PEAK	XPEAK	DPPEAK	XDPEAK			
£	.901E+06	3.304E+02 0 9.928E+01 0	•	0.			
1	.621E+06	9.928E+01 0		Ň.			
TIME	DXPM	PMAX	ХРМ	DPMAX	X D D M	TPMAX	XTOM
.0530		1.074F+07	383. 3.	289E+07		4.348E+07	
(1	PEAK	1.074E+07 XFEAK	DODEAN	XDPEAK	7010	7 1 3 7 WL 7 U /	2011
7	, , ,	~ · · · · · · · · · · · · · · · · · · ·	OFFERN				
, , , , , , , , , , , , , , , , , , ,	300E 404	3.405E+02 0 8.132E+01 0	•	0.			
4	* 70 AC 4 AU	0.1755.01 0	,	0•			

PROBLEM NUMBER
PRESSURE IN PASCALS

13.0049 DISTANCE IN METERS

TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPHAX	XIPH
•056n	2.	9.9725+06		393. 2.895E+07	393.	3.8928+07	393.
	PEAK	XPEAK		DPPEAK XDPEAK			
6.	957E+06	3.506E+02	0.	0.			
4.	381E+06	9.9288+01	9.	0.			
TIME	DXPM	9.928E+01 XAM9		XPM DPMAX	XDPM	TPMAX	XTPM
-0600	2.	9.010F+06		408. 2.422E+07	408.	3.323E.07	408.
	PEAK	XPEAK		DPPEAK XDPEAK			
6.	076E+06	3.6368+02	C.	0. 0. XPM DPMAX 424. 1.983E+07			
4 0	346E+06	1.199E+02	٥.	0.			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPHAX	XTPM
-0650	2.	8.037E+06		424. 1.983E+07	424.	2.787E+07	424.
	PEAK	XPEAK		DPPEAK XDPEAK			
5.	208E+06	3.800E+02	Q.	0.			
4.	089E+06	1.377E+02	0.	0 <b>.</b> 0 <b>.</b>			
TIME	DXPM	PMAX	• •	XPM DPMAX 441. 1.659E+07	XDPM	TPHAX	XTPM
.0700	2.	7.3236+06		441. 1.659E+07	441.	2.372E+07	441.
	PEAK	XPEAK		DPPEAK XDPEAK			
4.	003E+06	1.5410+02	0.	0.			
3.	684E - 06	3.313E+01	O.	0. 0. XPM DPMAX 454. 1.375E+07			
TIME	DXPM	PMAX	• • •	XPM DPMAX	XDPM	TPHAX	XTPM
.0750	3.	C.497E+06		454. 1.375E+07	457.	2.024E+07	457.
	PEAK	XPEAK		DPPEAK XUPEAK	•	_	
3.	821E+06	1.646E+02	0.	0.			
3.	653E+06	1.646E+02 7.124E+01	0.	0.			
TIME	DXPM	MAX		XPM DPMAX 471. 1.201E+07	XDPM	TPMAX	XTPM
.0800	3.	6.004E+06		471. 1.201E+07	471.	1.801E+07	471.
	PEAK	XPEAK		DPPEAK XOPEAK	· -		
3.	518E+06	1.853E+02	Э.	0.			
3.	528E+06	1.853E+02 7.124E+01	0.	0.			
TIME	DXPM	PMAX	_	XPM DPMAX 481. 1.062E+07	XDPM	TPMAX	XTPM
.0850	3.	5.500F+06		481. 1.062E+07	484.	1.61CE+07	484.
	PEAK	XPEAK		OPPEAK XOPEAK			
3.	1935+06	1.980E+02 9.056E+01	0.	0.			
3.	325E+06	9.056E+01	0.	0.			
TIME	DXPH	PMAX		XPM DPMAX 496. 9.154E+06	XDPH	YPMAX	XTPM
-0900	3.	5.045E+06		496. 9.154E+06	496.	1.4202.07	496.
	PEAK	XPEAK		DPPEAK XDPEAK			
2.	921E+06	2.163E+02	0.	0 •			
3.	083E+06	8.131E+01	0.	0 • 0 •			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
-0950	3.	4.64RF+06		507. 8.267E+06	510.	1.282E.07	507.
	PEAK	<b>XPEAK</b>		507. 8.267E+06 DPPEAK XDPEAK			
2.	709E+06	2.317E+02	0.	2•			
7.	897E+06	6.779E+01	0.	0.			

PROBLEM NUMBER 13.0049
PRESSURE IN PASCALS DISTANCE IN METERS

TIME	DXPM	PMAX	XPM DPMAX 519. 7.512E+06 DPPEAK XDPEAK	XDPM	TPMAX	XTPM
.1000	3.	4.320E+06	519. 7.512E+06	522. 1.	180E+37	519.
	PEAK	XPEAK	DPPEAK XDPEAK			
2	-523F +06	2.458F+02	0. 0.			
2	.618E+06	9.431E+01	0. 0.			
TIME	DXPM	PMAX	XPM DPMAX	XOPM	TPMAX	XTPM
-1100	3.	3.778E+06	543. 6.379E+06	543. 1.	016E+07	43.
		NI EMI	D. 1 CAN AD. CAN			
2	-227E+06	2.729E+02	3.516E+06 5.119E+02			
2	.163E+06	2.149E+02	0. 0.			
TIME	DXPM	PMAX	XPM DPMAX	XDPM	TPMAX	XTPM
.1201			564. 5.484E+06	564. B.	836E+06	564.
	PEAK	XPE: '	DPPEAK XDPEAK			
			2.684E+06 5.257E+02			
1	.567E+06	S-155E+01	0. 0.			
TIME		PMAX	XPH DPMAX	XDPM	TPMAX	XTPM
-1300			581. 4.836E+06	584. 7.	779E+06	584.
			DPPEAK XDPEAK			
1	.823E+06	3.333E+02	2.079E+06 5.395E+02			
	• 125E+06	2 • 122E • 01	0. 0.		<b></b>	~ <b>~</b>
	DXPM	PMAX	XPM DPMAX 595. 3.732E+06	XUPM	IPMAX	X IPM
-1400	8.	2.753t +06	595. 3./32E*06	272. 0.4	4835 • 00	595.
_			DPPEAK XDPEAK			
			1.614E+06 5.533E+02			
	./74E+U5	5.415F+01	0. 0.	~OOM	TPMAX	VIDA
TIME	UXPM	PMAA	XPM DPMAX 512. 3.128E+06	AUPM	538E+06	612.
-1500	PEAK	2.410E400	DPPEAK XDPEAK	015. 2.	2305.400	015.
			4.139E+05 3.952E+02			
	3055-05	3.7045.402	0. 0.			
TIME	MAKU	DMAY	XPH DPMAX	YORM	TPMAX	X TPM
-1600	A.	2-181F+06	XPH DPMAX 628. 2.776E+06	628. 4.0	TPMAX 957E+06	628.
•10011	PEAK	ADEVE	OPPEAK XDPEAK	0201 41	7512.00	0200
1			4.011E+05 4.285E+02			
	912F+05	3-037F+02	0- 0-			
TIME	DXPM	PMAX	XPM DPMAX 645. 2.567E+06 DPPEAK XDPEAK	XDPM	TPMAX	XTPM
-1710	8.	2.013E+06	645. 2.567E+06	645. 4.5	579E+06	645.
,	PEAK	XPEAK	OPPEAK XDPEAK			
1	.513E+06	4.535E+02	3.905E+05 4.535E+02			
5	111E+05	4.161F+00	0.			
TIME	DXPM	PMAX	XPM DPMAX	XDPM	TPMAX	
.1800	8.	1.865E+06	662. 2.435E+06	662. 4.3	300E+06	662.
	PEAK	XP'E AK	DPPLAK XUPEAK			
			3.848E+05 4.868E+02			
5	.518E+05	4.161E+00	0. 0.			

PROBLEM NUMBER 13.0049
PRESSURE IN PASCALS DISTANCE IN METERS

TIME	DXPM	PMAX	XPM DPMAX	XDPM TPMAX	XTPM
.1900	8.	1.737E+06	670. 2.334E+06	678. 4.054E+06	
• • •	PEAK	PMAX 1.737E+06 XPEAK	OPPEAK XOPEAK		
1 •	286E+06	5.034E+02	J.825E+05 5.117E+02		
		4.161E+00	0. 0.		
TIME	DXPM	PMAX	XPM DPHAX	XDPM TPHAX	XTP14
.2000	8.	1.648E+06	686. 2.225E+06	695. 3.796E+06	695•
	PEAK	XPEAK	DPPEAK XDPEAK		
1.	207E+06	5.367E+02	J.852E+05 5.450E+02		
7.	035E+05	4.161E+00			
TIME		PMAX		XDPM TPMAX	XTPH
-2100	8.	1.556E+06	703. 2.061E+06	711. 3.563E+06	703。
	PEAK		OPPEAK XDPEAK		
			3.955E+05 5.700E+02		
7.		4:161E+00			
TIME	DAPH	PMAX	XPM DPMAX	XDPM TPMAX	
•230n	8.	1.404E+06	728. 1.951E+06	736. 3.283E+06	736•
	PEAK		DPPEAK XDPEAK		
1 •	027E+06	6.116E+02	3.818E+05 6.116E+02		
7.		1.706E+02			
TIME	DXPM	PMAX	XPM DPMAX 753. 1.775E+06	XDPM TPMAX	XTPM
.2500		1.2738+06	753. 1.775E+06	761. 3.003E+06	761.
	PEAK	XPEAK	DPPEAK XOPEAK		
7.	957E+05	2.538E+02	3.034E+05 6.449E+02		
		4.161E+00			
TIME				XDPM TPMAX	XTPM
• 560u		1.216E+06	761. 1.660E+06	778. 2.811E+06	770.
	PEAK	XPEAK	DPPEAK XDPEAK		
			2.562E+05 6.532E+02		
		4.161E+00			v <b>201</b> 4
TIME		PMAX	XPM DPMAX	XOPH TPMAX	XTPM
.2800		1.128E+06		803. 2.590E+06	795.
_	PEAK	XPEA'	DPPEAK XDPEAK		
6.	3686+05	3.453E+02 4.161E+00	0.		
				XDPM TPMAX	VIDU
TIME		PMAX	XPM DPMAX		
.3000	-	1.060E+06	811. 1.383E+06	820. 2.431E+06	07:0 0
	PEAK	XPEAK	DPPEAK XDPEAK		
4.	/ D   E + V D	5.284E+02 3.952E+02			
	DXPM	PHAX	O. O. DPMAX	XDPM TPMAX	XTPM
*11ME		1-005E+06	836. 1.314E+06		
• 3EUII	PEAK	XPEAK	DPPEAK XDPEAK	0434 E4343F440	0434
<b>e</b> . <i>i</i>		4.452E+02			
		4.161E+00			
~ • •	- · · · · · · · · · ·	~ F 1 O 1 F ~ V V	V = V =		

PROBLEM N	IUMBER	SCALS	13.	0049	7 N . A	FTEDE			
PRESSURE	TH PA	SCAES	013	MANCE	Tian is	EIENS			
	0404	M1144				5544 V	<b>"05</b> "	751144	¥204
		PMAX						TPMAX	
• 3400							8/0.	2.184E+06	870.
		XPEAK		_					
		4.868E+02							
3.30	6E+05	6.241E+01			0.				
TIME		PMAX						TPMAX	
• 360n	8.	9.199E+05		886.	1.15	1E+06	895.	2.031E+06	895.
		XPEAK							
4.31	1E+05	5.284E+02	0.		0.				
0.	_	0.							
TIME	DXPM		•••	XPM		DPMAX	<b>XDPM</b>	TPMAX	XTPM
								1.960E+06	
1000		XPEAK						•••••	
4.11		5.700E+02						•	
1.20	6F+05	4-285E+02	0.		Ú.				
TIME	DYPM	PMAX	•••	YPM			YOPM	TPMAX	XTPM
								1.856E+06	****
• 444()	PEAK					XDPEAK	7341	110305.00	7301
- 04		6.116E+02				• • • • • • • • • • • • • • • • • • • •			
• • •					-			•	
		4.785E+02			0.	DPMAX	UBBM	TOMAN	VERM
TIME				XPM					XTPM
•4200							<b>400</b> •	1.802E.06	956.
		XPEAK							
		1.102E+03							
1.12	JE+03	1.088E+03	0.		0.				

PROBLEM NUMBER 13.0054
PRESSURE IN PASCALS DISTANCE IN METERS

TIME	DXPH	PMAX		XPM DPMAX	XDPM	TPMAX	
.0103	2.	-1.013E+05	•	239. 1.571E-05 DPPEAK XDPEAK	1.	0•	0 •
	PEAK	XPEAK		DPPEAK XDPEAK			
0.		0.	4,	786E-06 2.370E+02			
0•		0.	٥,	0.			
TIME						TPMAX	
.0110	25.44	1.1536+03	}	239. 6.8078-02	237.	1.157E+03	539•
	PEAK			OPPEAK XDPEAK			
-1.0	100E - 03	2.350E+02	. 0	0.			
TIME	DXPM	1.000E+00		0.	~ABM	TOMAY	VTDM
•012n	UAFM 2.	1.197F447	) 1	XPM DPMAX 239. 3.780E-01	XUPH	TPMAX	220
• • • • • • •	PEAK	ADEAN .	'	DPPEAK XDPEAK	231.	1.1525-02	2370
-1.0			Δ.	O. O.			
-140	184F + 63	2.310E+02		0.			
TIME	DXPM	DMAX	•	XPM DDMAX	Y COM	TOMAY	YTOM
.0130	۳. نام ال	1.1235.03		XAMQQ MQX 239. 9.2928-01	277.	1.123F+03	230
	PEAK	XPEAK		DPPEAK XDPEAK	2311	111525.03	2070
~1.0	24F+03	2.350F+02	0.	0.			
-1.0	83E+03	2.350E+02 2.310E+02	Ŏ.	Ŏ.			
TIME	DXPH	PMAX	••	XEM DPMAX	XDPM	TPMAX	XTPM
.0140	2.	1.1238.03		XPM DPMAX 23% 1.705E+00	237.	1.123E+03	239.
	PEAK	XPEAK		DPPEAK XDPEAK	•••		
-9.7	27E+02	2.350E+02	0.	0.			
-1.0	82E+03	2.310E+02	0.	Ö.			
TIME	DXPH	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
.0150	2,	1.123E+03		XPM DPMAX 239. 2.681E+00	237.	1.123E+03	239.
_	PEAK	XPEAK		DPPEAK XDPEAK			
-9.0	74E+02	2.350E+02 2.310E+02	0.	0.			
-1.0	B1E+03	2.310E+05	0.	0.			
TIME				XPM DPMAX	XOPM	TPMAX	XTPM
.0160	2.	2.388E+07		1. 4.734E+07	1.	7.12ZE+07	1.
_	PEAK		_	DPPEAK XDPEAK			
0 •		0.	0.	0.			
2		0.	0.	0.		==	
TIME .0170	DXPH					TPMAX	
.01.0	l. DEAN			2. 1.614E+08	37.	3.420E+08	25•
•	PEAK			DPPEAK XDPEAK			
. 0.		0.	V •	0 • 0 •			
TIME	DXPM	• •		XPM OPMAX	<b>400</b> H	TPMAX	VTDM
.0180		2.956E+08		45. 1.584E+08			
	PEAK	XPEAK		DPPEAK XDPEAK	00.	304615400	33.
1.30		8.121E+00	۸.	O. AUPEAN			
0.		0.	Õ.	0.			
			~ ~	<b>v</b> 7			

PROBLEM NUMBER
PRESSURE IN PASCALS

13.0054
DISTANCE IN METERS

TIME	DXPM	PMAX 2.799E+08		KPM	DPMAX	XDPM	TPMAX 3.475E+08	XTPM
.0190		2.799E+08	(	<b>67.</b> 1.	.569E+08	77•	3.475E+08	70•
	PEAK		DI		XDPEAK			
10	450E+08	3.685E+01	1.72	7E+07				
0.		0. PMAX	0.		0•			
TIME	DXPM	PMAX		KPH	DPMAX	XDPM	TPMAX	XTPM
.0200	1.	5.612E.08	(	84. ].	.583E+08	91.	3.5278+08	84.
	PEAK	XPEAK	Di	PPEAK	XDPEAK			
14	J29E+08	6.271E+01	2.57	1E+07	6.990E+01			
		5.247E+00	0.		0•			
TIME	DXPM	PMAX	,	XPM	DPMAX	XDPM	TPMAX	XTPM
.0210	5•	2.373E+08	•	98. 1.	.401E+08	103.	3.411E+08	98.
	PEAK	XPEAK	DI	PPEAK	XDPEAK			
1	181E+08	8.050E+01	0.		0•			
0.	,	0.	0.		0.			
TIME	DXPM	PMAX	,	KPM	DPMAX	XDPM	TPMAX	XTPM
.0230	2.	2.008E+08	12	21. 1.	.421E+08	124.	80+3E6S.E	121.
	PEAK	XPEAK	DF	PEAK	XDPEAK		3.263E+08	
1	028E+08	1.067E+02	0.		0 •			
ō.		0.	0.		0.			
TIME	DXPM	PMAX	)	KPM	DPMAX	XDPM	TPMAX	XTPM
.0250	2.	1.654E+08	14	.0. 1	.363E+08	142.	80+3296·S	140.
	PEAK	XPEAK	DF	PPEAK	XDPEAK			
8	818E+07	1.282E.02	0.		0 •			
0 •	)	0.	0.		0.			
TIME	DXPM	PMAX	,	(PM	DPMAX	XDPM	TPHAX	XTPM
.0260	2.			•7• 1·	.343E+08	149.	80+3E67.S	149.
	PEAK	XPEAK			XDPEAK			
8.	215E+07	1.378E+02	0.		0.			
0.	1	0.	0.		0.			
TIME	DXPH	PMAX	)	(PH	OPMAX	XDPM	TPHAX	XTPM
0880•							2.475E+08	164.
	PEAK	XPEAK	DF	PEAK	XDPEAK			
0 •	•	0.	0.		0.			
0.		0.	0.		0.			
TIME	DXPM	PMAX	×	(PM	DPMAX	XDPM	TPMAX	XTPM
-0300							2.248E+08	178.
	PEAK			PEAK	XDPEAK			
0 •		0.	0.		0.			
9.		0.			0.		_	
TIME	DXPM	PMAX	X	(PH	DPMAX	XDPM	TPMAX	XTPM
.0320							2.030E+08	190.
-	PEAK	XPEAK	DP	PEAK	XDPEAK			
0 •		0.	0.		0.			
0.		0.	0.		0.			

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PROBLEM NUMBER
PRESSURE IN PASCALS

13.0054 Distance in Meters

<b></b>							
TIME	DXPM			XPM DPMAX	XDPH		
•0340		6.808E+07		201 · 1 · 033E · 08	201•	1.714E+08	201.
	PEAK	****	_	DPPEAK XDPEAK			
0 •		0.	٥.	• •			
0•		0.	0.		_		
TIME	DXPM			XPM DPMAX	XOPM		
•036n		5.966E+07		212. 1.044E+08	212.	1.641E+08	212.
	PEAK	XPEAK		DPPEAK XDPEAK			
0.		0.	0.				
		0.	0.				
TIME	DXPM			XPM DPMAX		TPHAX	
•0380		5.508E+07		220. 1.070E+08	220.	1-621E+08	220•
	PEAK			DPPEAK XDPEAK			
0•		٥.	0.				
0•		0.	0.	0.			
TIME	DXPM			XPM DPMAX	XDPM		
-0400		4.957E+07		229. 1.106E+08	535•	1.565E+08	229.
	PEAK	XPEAK		DPPEAK XDPEAK			
0 •		0.	0.	0•			
0.		0.	0.	0.			
TIME	DXPM			XPM DPMAX	XDPM		
.0420	2.	4.416E+07		238. 1.101E+08	240.	1.510E+08	238.
	PEAK	XPEAK		DPPEAK XDPEAK			
0•		0.	0.	0.			
0.		0.	0.	0•			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
• 0450	2.	3.6288+07		249. 1.008E+08	253.	1.359E+08	251•
	PEAK	XPEAK		DPPEAK XDPEAK	_		
0.		0.	O.	0.			
0•		0.	0.	0.			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPHAX	XTPM
.0480	2.	3.115E+07		260. 9.326E+07	265.	1.226E.08	263.
	PEAK	XPEAK		DPPEAK XDPEAK			
0.		0.	0.	0•			
0.		0.	0.	0•			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
.0500	2.	2.816E+07		267. 8.76QE+07	272.	1.126E+08	270.
	PEAK	XPEAK		DPPEAK XDPEAK			
0•		0.	0.	0.			
0.		0.	0.	0•			
0.		0.	0.	0.			
TIME	DXPM	PMAX		XPH DPMAX	XOPM	TPHAX	XTPM
.0530		2.4712+07		277. 7.891E+07	281.	1.012E+08	281.
	PEAK	XPEAK		DPPEAK XDPEAK		-	-
0•		0.	Ű.	0.			
0•		0.	0.	0 •			

PROBLEM NUMBER
PRESSURE IN PASCALS

13.0054 DISTANCE IN METERS

T TANK	D. D. L.	5344		V014 D01444	×004	TOMAN	VIDA
TIME	DXPM	ZAMY		XPM DFMAX 287. 7.161E+07 DPPEAK XDPEAK	XUPM	TPMAX	AIPM
•0560	E.	2.225.407		20/• /•IOIE•U/	292.	4.0/02.40/	272.
		APEAR		UPPEAR AUPEAR			
0.	-	0.	٧.	0• 0•			
TIME	nvou	0. PMAX	0.	XPM DPMAX	LODA	TPMAX	VTDM
.0600	0AFM	2.020FA07		200. 4 E2054A7	70F	9.280F407	304.
* 000(	PEAK	2002UC 101		299. 6.529E+07 DPPEAK XDPEAK	3000	0+20/2+0/	3040
		0.	^	Û.			
0	•	0.	0.				
TIME	DXPM			XPM DPMAX	XDPM	TPMAX	X TPM
•065n	2.	1.7758+07		313. 5.836E+07	773.	7.381E+07	320.
	PEAK	XPEAK		313. 5.836E+07 DPPEAK XDPEAK			
0.		0.	0.	0.			
0	· •	0.	0.				
TIME	DXPM	PMAX		XPY UPMAX	XDPM	TPMAX	XTPM
.0700	2.	1.517E+07		328. 5.142E+07	337.	6.429E+07	335.
	PEAK	XPEAK		328. 5.142E+07 DPPEAK XDPEAK			
0.		0.	0.	0•			
0•		0.	٥.	0		<b>***</b>	
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
.0750	20	1.59/5.01		342. 4.448E+07 DPPEAK XDPEAK	354.	3.5306.61	352•
0•		0.	0.	0 • 0 •			
TIME	DABM	O. PMAX			V DOM	TPMAX	× TDM
.0800				396. 3.857E+07			
*****	PEAK	XPEAK		DPPEAK XDPEAK	3001	401104	5555
6.		3.866E+02					
0.		0.	0.7	0.			
TIME		PMAX		XPM DPMAX	XDPH	TPMAX	XTPM
.0850	3.	9.420E + 06		370. 3.305E+07	383.	4.077E+07	381.
	PEAK	XPEAK		DPPEAK XDPEAK			
5•	759E+06	4.012E+02		0•			
0.		0.	٥.	0.			
TIME		PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
.0900				382. 2.839E+07	401.	3.4896.07	395.
_	PEAK	XPEAK		OPPEAK XDPEAK			
		4.170E+02	0.	0 • 0 •			
TIME			٠.	XPM DPMAX	XDPM	TPMAX	XTPM
.0950		7.028E+06		395. 2.4565.07	414	3.009F+07	
- <b>-</b> (*	PEAK	XPEAK		OPPEAK XOPEAK	4446	349076.01	~V # #
5.		4.332E.02	0.	0.			
9.			Ö.	Ŏ.			
, ,		•	. •	• •			

13.0054 DISTANCE IN METERS

<b>.</b> .		5144 ¥		VOM BOMAY	4 DD44	TOMAY	XTPH
TI		PMAX 6-170E+06		XPM DPMAX	XUPH	TPMAX	
-10	U() J. Peak				4710	2.688E • 07	444.
	4.019E404	4.405E402	Λ.	DPPEAR AUPEAR			
	4.4155.00	4.495E+02	0.	0 • 0 •			
T f	O. Me DXPM				YDDM	TPMAX	X TPM
.ii		4-923E+06		431. 1.855E+07			
	PEAK			DPPEAK XDPEAK	4	F1244 4.	****
		4.766E+02	0.	0.			
	0.	0.	O.	0.			
TI	ME DXPM	PMAX	• •	XPH DPMAX	XOPM	TPHAX	XTPM
.12	3.	4.028E+06		451. 1.535E+07 DPPEAK XDPEAK	496.	1.921E+07	499.
-	PEAK	XPEAK		DPPEAK XDPEAK			
	3.990E+06	5.015F1		0•			
	O•	0.	0.	0.			
	HE DXPM	PMAX		XPM DPMAX 528. 1.285E+07	XDPM	TPMAX	
	00 J.	3.644E+06		528. 1.285E+07	522•	1.634E+07	522•
	i LAK	XPEAR		UPPEAK XUPEAK			
		4.716E+02					
		8.065E+00	0.	0.		<b>***</b> ****	
• -	TE DXPH	PMAX		XPH DPMAX	XOPM	TPHAX	
-14	00 3.	J.2885+00		550. 1.081E+07	540.	1.401E+07	546.
	PEAK	XPEAK					
		4.904E+02					
		1.178E+02 PMAX		XPM DPMAX	<b>- 004</b>	TPHAX	XTPH
- 15		7.031F404		573. 9.201E+06	E40.	1.216F467	569.
• 13	PEAK	XPEAK			3076	1.5100.01	3071
		5.068E+02					
		1.438E+02		0.			
TI	E DXPM	PMAX			XDPM	TPMAX	XTPM
-16				595. 7.892E • 06	591	1.065E+07	591.
	PEAK	XPEAK		DPPEAK XOPEAK		•••••	
	2.204E+06	5.261E+02	0.	0.			
		1.585E+02		0.			
TI	IE DXPH	PMAX		XPM DPMAX	XDPH	TPMAX	XTPM
.170	10 4.	2.559E + 06		613. 6.813E+06	610.	9.321E+06	613.
	PEAK	XPEAK		OPPEAK XDPEAK			
		5.442E+02		0•			
		9.803E+00	٥.	0.			
TIA	-	PMAX		XPM DPMAX	• • • • • • • • • • • • • • • • • • • •	TPHAX	
-180		2.377E+06		635. 5.96ZE+06	631.	8.335E+06	631.
	PEAK	XPEAK	_	DPPEAK XDPEAK			
		5.588E+02		0.			
	1.0536.00	6.5302.01	0.	<b>0</b> •			

13.0054 DISTANCE IN METERS

TIME	DXPM	PMAX		XPM	DPMAX	XDPH	TPMAX	XTPM
.1900	4.	2.221E+06		652. 5	210E+06	647.	7.383E.06	652•
	PEAK	XPEAK		DPPEAK	XDPEAK	•		
1.0		5.759E+02			0.			
1.7	711F+06	1.042E-02	0.		0.			
TIME		PMAX	••	XPM		XDPM	TPMAX	XTPM
-2000					599E+06		6.6578-06	
15000	PEAK			DODEAK	XDPEAK	000*	000014 00	
		5.927E+02	۸.		0.			
1.0	565E + 06	1.324E+02	٥.		0.			
TIME	DXPM	PMAX	••	XPM	DPMAX	YOPM	TPMAX	XTPM
-2100	4.	1-031FAAA		686. 4.	1175+06		6.044E+06	
• 2 1 0 ()	PEAK				XOPEAK		010444	****
•		6.054E+02						
		1.590E+02			0.			
TIME	DXPH	PMAX	٧.	XPM	DPHAX	YOPH	TPMAX	XTPM
.2300	4.	1.7275.06		719. 7.	346F406	719.	5.069E+06	719.
• 5 3 0 ()	PEAK			DODEAK	XDPEAK	1174	310074.00	,,,,
		6.390E+02						
1.	1036 - 00	3 0705+02	٧.		0.			
	DXPM	2.078E+02	٠.	XPM		V CHA	TPMAX	YTDM
TIME	UAFM	PMAA.		7/4 2	7/05/04	744	4.276E+06	746.
<b>,250</b> n	PEAK				XOPEAK	7401	405105-00	7401
		XPEAK 6.674E+02						
1.0	133E + 16	2 4545442	٥.		0.			
744	DXPM	2.654E+02 PMAX	•	XPH		VDDM	TPMAX	XTPM
TIME		PMAA.		760 3	CAREAAA	760	3-960E+06	760.
.2600	PEAK			1000 S	XDPEAK	700.	3.4005.00	750
8+1	1E 3E . AE	3.193E+02	٧.		0.			
TIME	DXPM	4.676E+01	V •	VDM	ODMAY	VDBM	TDMAY	XTPM
	שאריי	7724F404		700. 3	1405404	788-	TPMAX 3.466E+06	788
.2800	PEAK	XPEAK		DODEAL	XDPEAK	100.	3.4000.00	7000
- 1		3.570E+02			Q.			
	LIGEARE	9.573E+00	٠.		0.			
TIME	DXPM	PMAV	٧.	VDM	DDMAY	vnDM	TPHAX	XTPM
	DAEM	1 2025404		912 1	DPMAX 836E+06		3.019E+06	
<b>.300</b> 0	PEAK	1 + 2 U Z C + U O		DODETA	XDPEAK	010.	3.0175.00	0101
		3.936E+02						
		9.020E+01			0.			
*IME	DXPM	DMA-	w.	YDM	DOMAY	YORM	TPMAX	XTPM
.3200	UAFIT	PMAX 1-109E+06		AFM 838. 1	4.016404		2.711E+06	
* 3200	PEAK	XPEAK			XOPEAK	030+	54117-00	0 34,4
		4.305E+02						
D 4 •	140E + VE	7.116E+01	1.6	. 60E TUB				
4 • •	3716703	. • 1 105 +0 f	v.		0.			

13.0054 DISTANCE IN HETERS

TIME	E DXPM	DMAN.	V544				
•340¢				DPMAX	XDPM		
• 3 7 0 (	PEAK	1.024E+06	004. I	• 4335 + 06	864•	2.479E+06	864.
		4.555E+02		XUPEAK			
	3.644E.AE	6 1555+05	1.0705.00				
TIME		5.155E+01 PMAX		0.			
•360¢				DPMAX	XDPM	TPMAX	XTPM
• 300(	PEAK	9.144E+05			884•	2.075E+06	884.
				XOPEAK			
	1235 + 03	1.491E+03	0.7416.05	4.3565.05			
TIME	DXPM	1.362E+03					
		PMAX 8.383E+05		DPMAX		TPMAX	
# 700 f			597. 1	018E+06	897.	1.857E+06	897.
•	PEAR	XPEAK	UPPEAK	XDPEAK			
ţ	1235403	1.491E+03 1.362E+03	1.5025.02				
TIME		PMAX	XPH	0.			
•400n		7.522E+05	APM O	DPMAX		TPHAX	
• 7000	PEAK				<b>923</b> 6	1.624E+06	923.
			UPPEAK	XDPEAK			
1	1235-03	1.491E.03 1.362E.03	1.1/25.02				
TIME		PMAX	XPM	0.		ma 200 a a a a a	
•4200	UAFM	7.209E+05	026 A	DPMAX		TPMAX	
• 7200	DEAK	XPEAK	730. 0.		936.	1.531E+06	936.
ļ	1235+03	1.491E+03 1.362E+03	1.1045.02				
TIME	UADM	1.3055.13	0.	0.			
.450n	UAPM	PMAX 6.707E+05	APM T	UPMAX	XDPM	TPMAX	
0 <b>4</b> 30()	PEAK	XPEAK	902. /.	040E+05	962.	1.375E+06	962.
		AFEAR	UPPEAR	XDPEAK			
	1235 + 03	1.491E+03 1.362E+03	1.1046.02				
TIME	DXPM	PMAX	U,	0.			
4800		6.319E+05	XPM	DPMAX		TPMAX	
9 40U()	PEAK	XPEAK	988. 6.	4556+05	1000.	1.263E+06	988.
			DPPEAK	XDPEAK			
1 4	1275-73	1.491E+03					
TIME		1.362E+03		0.			
.500n			XPM	DPMAX	XDPM		XTPM
• 500(1	DE VA	6.083E+05 XPEAK	1013. 6.	340E+05	1013.	1-242E+06	1013.
•	1235742	1-491E+03	DPPEAK	XDPEAK			
10	2072402	1 7475467	1 • EUZE • US				
1 •	1636 703	1.362E+03	V• (	)•			

PROBLEM NUMBER
PRESSURE IN PASCALS

13.0052
DISTANCE IN METERS

TIME	DVDM	OMAV		VDM DDMAV	- DOM	TOMAY	YTOM
.0122	2	-1-013E405		XPM DPMAX 239. 6.801E-06 DPPEAK XDPEAK	120	TPHAX	0.
10165	DEAM	ADEVA COTOCIO		S34 GIGATE-AG	1240	V•	<b>7.</b>
	FEAR	APEAN	۸	0.			
0 •		0.	0.				
TIME	DXDM	PMAX		XPH DPMAX	YORK	TOMAX	X TOM
.0130		1.1235.63		223. 1 7025-01	142.	1.1235403	221
14100	PEAK	IPFAK		223. 1.792E-01 DPPEAK XDPEAK	1.464	11100.00	
-1.8	117F+A3	1-170E+00	٥.	Q.			
7.		0.	Ö.	0.			
TIME	DXPM	PMAX	••	XPM DPMAX	XDPH	TPMAX	XTPM
.0140							
	PEAK	XPEAK		223. 8.374E-01 DPPEAK XDPEAK			
-1.8	114E+03	1-170E+00	0_	0.			
0.		0.	0.	0.			
TIME	DXPM	PMAX		XPH DPMAX		TPMAX	
.0150	2.	1.123E+03		223. 1.640E+00	142.	1.123E+03	223.
	PEAK	XPEAK		DPPEAK XDPEAK	-		
-1.8	11E+03	1.170E+00	0.	0•			
0.		Ú.	0.	XPM DPMAX			
TIME	DXPM	PHAX		XPM DPMAX	XDPM	TPHAX	XTPM
.0160	2.	1.123E+03		223. 2.250E+00 DPPEAK XDPEAK	142.	1.123E+03	223•
							•
	09E+03	1-170E+00	0.	<b>0</b> •			
0.		0.	0.	0. XPH DPMAX 223. 2.565E+00		<b>2 2 2 3 4 4 4</b>	
TIME	DXPM	PMAX		XPH DPMAX	XDPM	TPMAX	XIPM
.0170	20	1.1536.03		\$\$3. \$.303E+00	142.	1.1526+03	553.
	PEAK	APEAK	_	DPPEAK XDPEAK			
-1.0	U0E+U3	1.1105.00	Ŏ.	0. 0. XPM DPMAX 223. 3.002E+00			
TIME	DYDM	DMAY	٠.	VOM DOMAY	VODA	TOMAY	YTOM
.0180	2.	1.1235.43		223. 1.002F400	144	1.1235403	221.
.0100	PEAK	YDFAK		DPPEAK XDPEAK	1440	1.1525-02	2631
-1.6	78E+03	1.392E+02	0.	0.			
-1.8	07E+03	1-170E+00	0.	0. 0. XPM DPMAX 223. 3.777E+00			
TIME	DXPM	PMAX	•••	XPM DPMAX	XDPM	TPMAX	XTPM
.0190	2.	1-123E+03		223. 3.777E+00	144.	1-123E+03	223.
	PLAK	XPLAK		DOPPEAR EDDEAR			
-1.6	46E+03	1.392E+02	0.	0.			
-1.8	07E+03	1-170E+00	0.	Ŏ.			
TIME	DXPM	PMAX		0. 0. XPM DPMAX 223. 4.455E+00	XDPM	TPMAX	XTPM
.0200	2.	1.123E+03		223. 4.455E+00	144.	1.123E+03	223.
	FEAN	APEAR		UPPEAR AUPEAR	-		
-1.6	04E+03	1.392E.02 1.755E.01	0.	0.			•
-1.8	07E+03	1.755E+01	0.	0.			

13.0052 DISTANCE IN METERS

						_	
TIME	DXPM	PMAX	XPM	DPMAX	XDPM	TPMAX	XTPM
.0210	2.	1.123E+03	223.	4.9398+00	144.	1.123E+03	223.
	PEAK	XPEAK	DPPEA	K XDPEAK			
-1.55	8E+03	1.392E+02 1.989E+01	٥.	0.		•	
-1.80	6E+03	1.989E+01	0.	0.			
TIME	DXPM	PMAX	XPM	OPMAX 5.090E+00 K XDPEAN	XDPM	TPMAX 1.123E+03	XTPM
.0230	2.	1.123E+03	223.	5.090E+00	144.	1.123E+03	223.
	PEAK	XPEAK	DPPEA	K XDPEAR	•		
-1 - 37	0E+03	1.416E+02	0.	0.			
-1.80	AF+03	1.416E+02 1.989E+01	0.	0.			
TIME	DXPM	PMAX	XPM	DPMAX 6.085E+00 K XDPEAK	XDPM	TPMAX	XTPM
.0250	3.	1-123E+03	224.	6.085E+00	147.	1.123E+03	224.
10001	PFAK	APEAK	DPPEA	K XDPEAK			
-1.18	10E+03	1.410E+02	2.243E+0	0 1.410E+02			
00	46.47	3.121F.A1	Λ.	۸۰			
TIME	DXPM	PMAX	XPM	DPMAX 6.896E+00 K XDPEAK	XDPM	TPMAX	XTPM
0200	3.	1.1235+03	224.	6.896E+00	147.	1.123E+03	224.
10200	DEAK	YPFAK	DPPEA	K XDPEAK	•		<del>-</del> -
-1.21	6F+03	1.4105.02	2.513E+0	0 1.410E+02			
-1.80	AF+03	3.121F+01	0.	0.			
TIME	DXPM	DMAX	XPM	0. DPMAX 6.528E+00	XDPM	TPMAX	XTPM
.0280	ייי ייי	1.1235.03	200	6.528F+00	148.	1-123E+03	209.
.0200	PEAK	XDFAK	DPPFA	K XDPEAK	1.01		
-1.34				0 1.410E+02			
-1.30	11 F + 03	1.397E+02	0.	0.			
TIME	DXBM	PMAX	XPM	DPMAX	XDPM	TPMAX	XTPM
.0300	2.	1.123F+03	209.	DPMAX 7.581E+00	150.	1-123E+03	209.
*0500	PEAK	XPFAK	DPPF A	K XDPEAK	,		•••
<b>-1.29</b>		1.4356+02	2.971E+0	0 1.435E+02			
-1 - 78	7F+03	1-397F+02	2.005E+0	0 1.410E+02			
TIME	DXPM	PMAX	XPM	DPMAX	XOPM	TPMAX	XTPM
.0320	2.	1-123E+03	209-	DPMAX 7.644E+00	151.	1.123E+03	209.
	PEAK	1PFAK	OPPEA	K XDPEAK	• •	••••	
-1-41				0 1.435E+02			
-1.38	86.03	1.435E+02	0.	0.			
TIME		PMAX	XPM	DPMAX	XDPM	TPMAX	XTPM
.0340		5.623E+07	4.	5.612E+07	12.	1.112E+08	4.
*****	PEAK	XPFAK	DPPEA	K XDPEAK		•••••	
0.	L Chir	0.	0.	0.			
0.		Ŏ.	0.	0.			
TIME	DXPM	PMAX		DPMAX	XDPM	TPMAX	XTPM
.0360	6-	1.2278+08	51-	5.424E+07	67.	1.329E+08	56-
14240	PFAM	MOFAK	DPPFA	5.424E+07 K XDPEAK	3,0		
0.		9.	0.	0.			
0.		0.	0.	0.			
·, ·			- <del>-</del>				

13.0052 DISTANCE IN METERS

TIM			XPM DPMAX	XDPM TPMAX	XTPM
.038		1.143E+08	82. 5.398E+07	94. 1.355E+08	86.
	PEAK		DPPEAK XDPEAK		
	5.679E<07	5.243E+01	5.513E+26 6.241E+01		
	5.455E+U7	4.578E+G1	0. 0.		
TIM	E DXPH			XDPM TPMAX	
-040		1.038E+08	106. 5.1398+07	114. 1.329E+08	108.
	PEAK		DPPEAK XDPEAK		
		8.534E+01	8.607E+06 9.140E+01		
,	3.202E+07	5.299E+01	0. 0.		
TIM	F DXPM	PMAX	XPM DPMAX	XDPM TPMAX	
.042	) 2 <b>.</b>	9.317E+07	126. 4.778E+07 DPPEAK XDPEAK	132. 1.272E+08	126.
	4.943E+07	1.076E+02	1.133E + 07 1.116E + 02		
•	3.010E+07	8.331E+01	0. 0.		
	DXPM		XPM DPMAX		
.045	. 2•	7.901E+07	148. 4.392E+07 Oppeak XDPEAK	152. 1.167E+08	150.
			1.526E+07 1.359E+02		
,	-817E+07	1.1775+02			
TIME	DXPM	PMAX	XPM ()PMAX	XDPM TPMAX	XTPH
.048	2.	6.595E+07	169. 3.999E+07	169. l.059E+08	169.
	PEAK	XPEAK	DPPEAK XDPEAK		
:	.955E+07	1.570E+02	0. 0.		
•	•	ŭ.	0. 0.		
TIME				XOPM TPMAX	
.0500	2.	6.031E+07	180. 3.997E+07	180. 1.003E+08	180.
	PEAK	XPEAK	DPPEAK XDPEAK		
3	.702E+07	1.687E+02	1.935E+07 1.710E+02		
	•	0.	0. 0.		
TIME	DXPM	PMAX	XPM DPMAX	XDPM TPMAX	XTPM
.0530	3.	5.098E+07	196. 3.849(+07	196. 8.947E+07	196.
	PEAK	XPEAK	OPPEAK XOPEAK	•	
0	•	0.	0. 0.		
	١.	0.	0. 0.		
TIME	DXFM	PMAX	XPM DPMAX		XTPM
.0560	3.	4.4225.07	212. 3.848E+07	212. 8.270E+0/	212.
	PEAK		DPPEAK XDPEAK		
4	.741E+06	3.105E+00	0. 0.		
9	•	0.	0. 0.		
TIME	DXPM	PMAX	XPM DPMAX	XDPM TPMAX	XTPM
.0600	3.	3.688E+07	230. 3.826E+07	230. 7.514E+07	
- ••	PEAK	XPEAK			
3	.626E+06	3.105E.00			
	•	0.	0. 0.		
•	•		• •		

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13.0052 DISTANCE IN METERS

TIME	DXPM	PHAX		XPM DEMAX 247. 3.5826+07 DAPEAK XDPEAK	XDPH TPMAX	XTPM
.0650	з.	2.983₹∘07		247. 3.582E+07	250. 6.510E+07	247•
	PEAK	XPEAK		DPPEAK XDPEAK		
0.		٥.	0.	0. 0. хри — DРМАХ		
0.		0.	0.	0.		
TIME	DXPM	MAX		XPM DPMAX	XDPM TPMAX	XTPM
-0700	3.	2.597E+07		267. 3.947E+07 OPPEAK XOPEAK	267. 6.545E+07	267.
	PEAK	XPEAK		DPPEAK XOPEAK	_	
0.		0.	0.	0.		
		0.	0.	Ö.		
TIME	DXPM	PHAX	•	0+ XPM DPMAX 2^1+ 4-183E+07 DW EAK XOPEAK	XDPM TPMAX	XTPM
.0750	3.	2.304E+07		271. 4.183E+07	284. 6.392E+07	284.
	PEAK	XPEAK		D' SAK XOPEAK		
n.		0.	0.	0•		
0		0.	0.	0.		
TIME"	DXPM	PMAX		XPH DPMAX	XUPM TPMAX	XTPH
.0800	3.	1.9615.07		296. 4.219E+07	299. 6.1335.07	299.
	PEAK	XPEAK		DPPEAK XDPEAK		_
0 •		0.	0.	0.		
0.		0.	o.	0 • 0 •		
TIME	DXPM	0. PHAX		XPM DPMAX	XDPM TPMAX	XTPM
.0850	3.	1.721E+07		311. 4.199E+07	314. 5.828E+07	314.
	PEAK	XPEAK		DPPEAK XDPEAK		
0.		0.	0.	0. 0. XPM DPMAX 323. 4.017E.07		
0 •		0.	0.	0•		
TIME	DXPM	PHAX		XPM DPMAX	XDPM TPMAX	XTPM
.0900	3.	1.484E+07		323. 4.017E.07	J29. 5.321E+07	329.
	PEAK	APEAK		DPPEAK XDPEAK		
0•		0.	Λ.	n .		
0.		0.	0.	<b>ö</b> •		
TIME	DXPM	PMAX		XPM DPMAX 338. 3.725E+07	XDPM TPMAX	XTPM
.0950	3.	1.303E.07		338. 3.725E+07	341. 4.9216+07	341.
	PEAK	XPEAK		DPFEAK XDPEAK		
0 *		0 .	0.	Q •		
0.		0.	0.	0.		
TIME	DXPM	PHAX		XPM DPMAX 350. 3.414E+07	XDPM TOMAX	XTPM
-1000	3.	1.159E+07		350. 3.414E+07	356. 4.488E+07	353.
	PEAK			DPPEAK XDPEAK		
0.		0.	0.	0•		
0.		0.	0.	0 • G •		
TIME	DXPM	PMAX		XPM DPMAX 371. 2.873E+07	XDPM TPMAX	X TPM
-1100	3.	9.413E+06		371. 2.873E+07	380. 3.694E+07	377.
	PEAK	XPEAK		DPPEAK XDPEAK		
0•		0, 0.	9.	0.		
0.		0.	0.	0.		

PROBLEM NUMBER	13.0052	
PRESSURE IN PASCALS	DISTANCE	IN METERS

TIME.	DXPM	PMAX 7.894E+06		XPM DPMAX 392. 2.388E.07	XUPM	TPMAX	XTPM
•120n	3.	7.894E+06		392. 2.388E+07	402.	3.0496.07	399.
	PEAK			DPPEAK XDPEAK			
0.		0.	0.	0•			
0•		0.	0.	0.	- DOM	TPMAX	V TOM
TIME	DXPM	PMAX		XPM DPMAX	AUPH	1 FRAFAA7	430
-1300	30	0./225.00		410. 2.039E.37 OPPEAK XOPEAK	4230	243702101	4200
	PEAR	APEAR					
0.		0.		0 • 0 •	•		
ŋ. Time	AVDM	O. PMAX	0.	XPH DPMAX	AUDM	TPMAX	x TPM
•1400	UAPM	6.002F406		430. 1.788E+07	443.	2-281E+07	440-
+1400	DEAK	OUUUZC VU		DPPEAK XDPEAK	7750	212012.01	7700
0.	FEAN	0.		0.			
0.		ŏ.	Ö.				
7IME	DXPM	PMAX	~	XPM DPMAX	XDPM	TPMAX	XTPK
.1500	3.	5.380E+06		446. 1.614E+07			
1.50()	PEAK	XPEAK		DPPEAK XOPEAK	,,,,,		
0.	1 6011	0.		0.			
0.		Ŏ.	Ŏ.				
TIME	DXPM	PMAX	••	XPM DPMAX 469. 1.449E+07	XDPM	TPMAX	XTPH
-1600	3.	4.751E+06		469. 1.449E+07	486.	1.836E+07	479.
	PEAK	XPEAK		DPPEAK XDPEAK			
2.5	92E+06	5.101E+02	0.	0.			
0.		0.	0.	0. XPM DPMAX 486. 1.296E+07			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAH	XTPM
.1700	3.	4.167E.06		486. 1.296E+07	507.	1.635E+07	500.
	PEAK	<b>XPEAK</b>		DPPEAK XDPEAK			
2.4	80E+06	5.308E+02	0.	0. 0. XPM DPMAX 502. 1.154E+07			
0.		0.	0.	0.			
TIME	DXPM	PMAX		XPM DPMAX	XOPM	TPMAX	XTPM
- 1800	4.	3.635E+06		502. 1.154E+07	528.	1.446E+07	520.
_	PEAK	XPEAK	_	DPPEAK XDPEAK			
Ş.3	149E+06	5.53GE+02 0.	0.	Q•			
7.		0.	0.	0.			- TAM
TIME		PMAX		XPM DPMAX 520. 1.030E+07	XUPM	IPHAK	AIFM
-1900	4.	3.192E+06		520. 1.0306.07	340.	1.5905.01	230+
	PEAK	XPEAK	_	DPPEAK XOPEAK			
5.5	405+00	5. /48E+ ,c	0.	0+			
7.	0 × 0 ×	5.748E+,L		0.	VADM	TPMAX	v #8M
TIME	UAPM	PMA.		APM UPMAA	AUPM	1.139E+07	
<b>.</b> 2000	90 884	C+0195-00		535. 9.229E+06 DPPEAK XOPEAK	2110	1.1745.01	2044
	PEAK	APEAR 6 0306453	^	DEFEAR AUPEAR			
5+1	015-00	5.929E+02	٧.	0•			
η.		V •	0.	0•			

PROBLEM NUMBER PRESSURE IN PASCALS	13.0052 DISTANCE	IN	METERS

TI	ME	DXP	<b>.</b>	PMA N						
.żi			• •	20+96	•	XPM		XDP	TPMAX	XTPM
		PEA	. E.J	XPEAK	)	552. 8.3	87E+06	596	1.027E+07	600.
	2.0	36F40	n 4 4.1	AFEAR			XUPEAK		• • •	
	0.	30F + 0	0.	205.405	. 0	· O	-			
TI	ME	DXP	м " "	PHAX	9,	10 Mag				
•23		A	- 2-A	32E+06		XPM	DPMAX	XDP	1 TPMAX	XTPH
•••	-,,	PEAL	2 - 2	XPEAK		584. 6.94	•8E+06	638,	8.648E+06	638.
	1.4	, ,,		46E+05		UPPEAK			-	
		. 46 - 96		005105		•				
TI	ME	DXP		PHAX	0.					
•25				AART CE		XPH	DPMAX	XDPM	TPMAX	XTPH
	-	PEAR		KPEAK		613. 5.83	3E+06	672.	7.388E+06	676.
	14	7F+06	4-84	-7E+02		DPPEAK				
	6.2	1F+05	2.50	5E+01	٥.	• •				
TIP	(E	DXPM	, 1	DMAU	V •					
+260	00		•	IAF+AA		701	DPMAX	XDPM	TPMAX	XTPM
	•	PEAK		PEAK		701. 5.37	2E+06	689.	6.871E-06	693.
	1.54	9E+06	6.25	8E+02	Λ.					-
	7.30	5E+05	8-43	0E+00	V •	• •				
TIM	E	DXPM	0045							
-280				0F+66		732. 4.56	DPMAX	XDPM	TPMAX	XTPM
	•	PEAK	* * * * * * * * * * * * * * * * * * *	PEAK		1350 4030	UE + 06	718.	5-921E+06	723.
	1.33	0E+06	6.53	5E+02	٥.,	DPPEAK	AUPEAR			
	A.30	9E+05	9.57	3E+00	^.	0-				
TIM	E	DXPM		PHAX	٧.	VBM 0.	3534 A W			
.300	Ō	5.	1.320	SE+NA		760. 3.90	PMAX	XDPM	TPMAX	XTPM
	_	PEAK	X	PEAK		DPPEAK	16706	751.	5 • 165E • 06	755.
•	1.16	4E+06	6.81	3E+02	٥.		AUPEAR			
	A • 25!	5E+05	9.57	3E+00	n .	0.				
TIME	5	DXPM		DMAY		VBM a	IDMA u			
-3200	)	5.	1.237	7E+06		792. 3.366	PMAX		TPHAX	XTPM
		PEAN	A P	'E AK		DPPEAK	TOBEAL	195.	4.54ZE+06	787.
1	.033	E+06	7.052	PE+02 (	١.	Λ.	AUPEAN			
7	'• 63a	E+05	1.055	E+01		Ö.				
TIME							PMAX	MARKA		
-3400	1	5.	1.141	PMAX E+06		818. 2.922		XUPH	TPHAX	
		PEAK	XP	EAK			XDPEAK	597.	016E+06	812.
9	.198	E+05	7.256	E+02 0		0.	AUFEAR			
6	<b>.</b> 590	E+05	1.087	FODD A	۱	<b>A</b> .				
TIME		DXPM	•	PHAX	•	XPM O	PMAX	w 65 ft 64	Without a	
<b>.</b> 360 n		5.	1 - 066	E+06		IAT. 5.EE11	TARA TARA	XDPM	TPHAX	XTPM
	1		AFI	Z 48	r	PPEAK	KOPEAK	013. 3	.578E+06	838.
A	.311	E+05 7	<b>/•</b> 5111	E+07 A	_	0.	NUTEAR			
5	.971	E+05	1.610	E+02 0	_	0.				
				•	-	V •				

PROBLEM NUMBER PRESSURE IN PASCALS	13.0052 D1STANCE	IN	METERS
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TI	ME	DXP	H	PHAX					
• 38	00	-		AFAAA	XPM		( xDP	M TPMAX	
	• ••	PEA	. 1.00	*E. * 0 6	869.	2.244E+06		7 218E-01	XTPM
	7.	7 E A	<u> </u>	PEAK	DPPEA	K XOPE	AM	• 3.218E.06	864.
	7.03	75.40	5 7.716	5E+02 (	0.	0.			
••	75.3	335 + 0	1.93	3E+02 (	3.	0.			
TI	ωž.	DXP	4	PMAX	XPH				
-40	00	6,	9.312	F+05	404	DPMAX	XDPI	4 TPHAX	XTPM
		PEAN	( 40	BEAM		1.984E+06	854.	2.906E+06	
	6.9	32F+n=	7.943	EAR	DPPEAL	K XDPE	AK		890.
	5.2	03F . ne	2.302	202 0	•	0 •			
TIP	46	DAPH	2.305	F.05 0	•	0.			
•420				PMAX	XPM	DPMAX	V004		
* 764	, ,	9.	8.749	E+05	918.	·762E+06		' '''	XTPH
		PEAK	XP	EAK		2000	, 913·	2+635E+06	913.
	1.14	?3E+03	1.003	F-03 A			NK.		
	1414	!JE+03	9.915	E+02 0	-	e.			
TIM	E	DXPH				0.			
.450	n		8.113		XPM	DPMAX	XDPM	TPMAX	M = 50.
		PEAK	0.1136		746. ]	.498E+06	946.	2.309E.06	XTPM
	E. 70	AF - AF	APE	AK			K	E • 307E • 110	946.
	- 44	AE - AE	0.450E	*02 1.	472E+06	9-126F-0	`` 2		
TIM	7077 F			· · ve   u	,	0.	•		
1 74.46		UKPH	P	MAX	XPM	DPMAX			
.480(	2	7.	7.455E	+05	977	275E+06	XDPM	TPHAX	XTPM
	_	PEAK	YDE	AM			977.	2.0202+06	977.
1	• 12:	3E+0)	1.))45	467 1	DPPEAK	9.382E+0	<		
ł	.123	E0+3	1.101E	-03 11	E015.00	A - 395E + 05	2		
TIME		DXPM		'VJ Ua		0.			
·5000			7.455	XAM	XPM	DPHAX	XDPM	TPMAX	
4,		PEAK	7.037E	705	997. j.	160E+06		1 PARK	XTPH
•	. 122	FLAT	XPE	1X	DPPEAK	XDPF AM	7766	1-863E+06	997.
	- 153	E-UJ	1 + 1 1 4 E +	03 1.1		XDPEAK 9-513E+02			
1	. 123	E+03 }	101E	03 0.		0* **3135+05	•		
			• -			u e			

APPENDIX B

AFWL HULL CALCULATION OF 1 MT, PRECURSED CASE

#### AFML HULL Calculation of 1 MT Surface Burst Precursed Case

PROBLEM N	NUMBER	13.0041	
PRESSURE	IN PASCALS	DISTANCE	IN METERS

TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  0.0 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	<b>.</b> .				MBM B8444		
PEAK   XPEAK   OPPEAK   XOPEAK   O.			M PMA	<u> </u>	XPM DPMAX	XDPM TPMAX	
0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0	.030		-1 - 013F + 0	5	469. 4.206E+07		363.
O.   O.   O.   O.   O.   O.   O.   O.							
TIME			0.	٠,	0.		
.0400					0.		
## A.928E.06	-	-			APM DPMAX		
4.928E-06 2.797E-02 0. 0. 5.299E-06 1.988E-02 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0420 2. 8.523E-06 375. 3.024E-07 375. 3.877E-07 375.  PEAK XPEAK DPPEAK XDPEAK  5.688E-06 1.453E-02 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0450 2. 9.315E-06 387. 2.805T-07 385. 7.721E+07 385.  PEAK XPEAK DPPEAK XDPEAK  5.074E-06 1.163E-02 0. 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0480 2. 9.232E-06 395. 2.592E-07 395. 3.515E-07 395.  PEAK XPEAK DPPEAK XDPEAK  4.170E-06 2.331E-02 0. 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0500 2. 8.843E-06 401. 2.464E-07 401. 3.348E-07 401.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0500 2. 8.843E-06 401. 2.464E-07 401. 3.348E-07 401.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0500 2. 8.825E-06 0. 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0500 2. 7.754E-06 0. 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0500 2. 7.754E-06 DPPEAK XDPEAK  3.770E-06 2.989E-02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0500 2. 7.754E-06 XPEAK XDPEAK  3.576E-06 3.550E-02 0. 0.  TIME DXPM PMAX XPEAK DPPEAK XDPEAK  3.576E-06 3.550E-02 0. 0.  TIME DXPM PMAX XPEAK DPPEAK XDPEAK  3.576E-06 3.550E-02 0. 0.  TIME DXPM PMAX XPEAK DPPEAK XDPPAX XTPM  DPPEAK XDPEAK XDPEAK  3.576E-06 3.550E-02 0. 0.  TIME DXPM PMAX XPEAK DPPAX XDPM TPMAX XTPM  DPPEAK XDPEAK XDPEAK XDPEAK  3.576E-06 3.550E-02 0. 0.  TIME DXPM PMAX XDPM TPMAX XTPM  DPPEAK XDPEAK XDPEAK XDPEAK  3.576E-06 3.550E-02 0. 0.  TIME DXPM PMAX XPEAK XDPEAK XDPPAX XDPM TPMAX XTPM	.040	0 2	. A CF+0.	_	307. 3.314E+07	367. 4.291E+07	367.
S.299E-06   1.988E-02   0.   0.   0.   TIME   DXPM					UPPEAR XDPEAR		
TIME							
-0420							
FEAK XPEAK DPPEAK XDPEAK				Κ •	XPM OPMAX	XDPM TPMAX	
5.688E+06 1.033E+02 0. 5.176E+06 1.033E+02 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0450 2. 9.315E+06 387. 2.805E+07 385. 3.721E+07 385.  PEAK XPEAK XOPEAK XO	- 472		• 002575,00	•	3/3. 3.0242.07	3/5. 3.87/6.07	375.
S.176E+06   1.033E+02   0.			n Aprak		UPPEAR XDPEAR		
TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM 385.  PEAK XPEAK XPEAK XDPEAK X	,	5.000E TU	D :.45JE+02	: 0.	0.		
-0450 2. 9.315E+06		0 1 4 0E TU	0 1.0775.09	. 0.	0 + 0 C ( 4 + 1	es de la companya de	
PEAK XPEAK 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.	• • • • • • • • • • • • • • • • • • • •		M PRES		APM UPMAX	XUPM TI'MAX	XTPM
5.074E+06 1.183E+02 0. 0.  7. 0. 0. 0. 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0480 2. 9.232E+06 395. 2.592E+07 395. 3.515E+07 395.  PEAK XPEAK DPPEAK XDPEAK  4.170E+06 2.231E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0500 2. 8.843E+06 401. 2.464E+07 401. 3.348E+07 401.  PEAK XPEAK DPPEAK XDPEAK  4.013E+06 2.541E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0530 2. 8.256E+06 411. 2.383E+07 411. 3.209E+07 411.  PEAK XPEAK DPPEAK XDPEAK  3.790E+06 2.989E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0560 2. 7.754E+06 DPPEAK XDPEAK  3.576E+06 3.550E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0566E+06 3.550E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0566E+06 3.550E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM	• 473		• 4•312E46	•		302. 2.\S1E.0\	365.
TIME DXPM PMAX 395. 2.592E.07 395. 3.515E.07 395.  PEAK XPEAK DPPEAK XDPEAK XDPEAK XDPM TPMAX XTPM DPMAX XDPM			N APEAN		DPPEAK AUPEAK		
TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM 395. 2.592E+07 395. 3.515E+07 395. 3.515				: •	0.		
**************************************				٠.	U. SEMAN		W = 514
PEAK XPEAK OPPEAK XDPEAK 4.170E+06 2.231E+02 0. 0.  7.251E+06 1.094E+01 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0500 2. 8.843E+06 401. 2.464E+07 401. 3.348E+07 401.  PEAK XPEAK DPPEAK XDPEAK 4.013E+06 2.541E+02 0. 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0530 2. 8.256E+06 411. 2.383E+07 411. 3.209E+07 411.  PEAK XPEAK DPPEAK XDPEAK 3.790E+06 2.989E+02 0. 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0560 2. 7.754E+06 419. 2.291E+07 421. 3.039E+07 421.  PEAK XPEAK DPPEAK XDPEAK 3.576E+06 3.550E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM		L DAP	м  —		APH UPHAK	ADPR IPMAX	XTPH
4.170E+06 2.231E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0500 2. 8.843E+06 401. 2.464E+07 401. 3.348E+07 401.  PEAK XPEAK DPPEAK XDPEAK 4.013E+06 2.541E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0530 2. 8.256E+06 411. 2.383E+07 411. 3.209E+07 411.  PEAK XPEAK DPPEAK XDPEAK 3.790E+06 2.989E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0560 2. 7.754E+06 419. 2.291E+07 421. 3.039E+07 421.  PEAK XPEAK DPPEAK XDPEAK 3.576E+06 3.550E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0560 2. 7.754E+06 419. 2.291E+07 421. 3.039E+07 421.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0560 3.550E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM		DEAL	· vezjetiud	,	APPEAU COREAU	342. 7.2125.01	342.
TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0500	4		N AFEAN 6 3-3315403	٠.	DPFEAR AUFEAR		
TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0500							
PEAK XPEAK DPPEAK XDPEAK XDPEAK 4.013E.06 2.541E.02 0. 0= 0.066E.06 1.094E.61 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.					VOM DOMAY	UDBM	v <b>45</b> 4
PEAK XPEAK DPPEAK XDPEAK 4.013E.06 2.541E.02 0. 0= 5.066E.06 1.094E.01 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0530 2. 8.256E.06 411. 2.383E.07 411. 3.209E.07 411. PEAK XPEAK DPPEAK XDPEAK 3.790E.06 2.989E.02 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0560 2.7.754E.06 419. 2.291E.07 421. 3.039E.07 421. PEAK XPEAK DPPEAK XDPEAK 3.576E.06 3.550E.02 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM					401. 3.464F467	AUPH IVHAA	AIFR
4.013E.06 2.541E.02 0. 0= 5.066E.06 1.094E.01 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0530 2. 8.256E.06 411.2.383E.07 411.3.209E.07 411.  PEAK XPEAK DPPEAK XDPEAK 3.790E.06 2.989E.02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0560 2.7.754E.06 419.2.291E.07 421.3.039E.07 421.  PEAK XPEAK DPPEAK XDPEAK 3.576E.06 3.550E.02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM	10201			,	JOSEAN AUDEAN	4011 3.3405401	401.
.0530 2. 8.256E+06 411. 2.383E+07 411. 3.209E+07 411. PEAK XPEAK DPPEAK XDPEAK 3.790E+06 2.989E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0560 2. 7.754E+06 419. 2.291E+07 421. 3.039E+07 421. PEAK XPEAK DPPEAK XDPEAK 3.576E+06 3.550E+02 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM	4		. 2.54154A2	Λ.	DPPEAR AUPEAR		
.0530 2. 8.256E+06 411. 2.383E+07 411. 3.209E+07 411. PEAK XPEAK DPPEAK XDPEAK 3.790E+06 2.989E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0560 2. 7.754E+06 419. 2.291E+07 421. 3.039E+07 421. PEAK XPEAK DPPEAK XDPEAK 3.576E+06 3.550E+02 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM	-	-0665-06	1.0045-61	۸.	0-		
.0530 2. 8.256E+06 411. 2.383E+07 411. 3.209E+07 411. PEAK XPEAK DPPEAK XDPEAK 3.790E+06 2.989E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0560 2. 7.754E+06 419. 2.291E+07 421. 3.039E+07 421. PEAK XPEAK DPPEAK XDPEAK 3.576E+06 3.550E+02 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM	TIME	DXPA	DMAX	••	YPM TOMAY	UNDM TOMAL	V T DM
PEAK XPEAK DPPEAK XDPEAK 3.790E+06 2.989E+02 0. 0. 0. 0. 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM .0560 2.7.754E+06 419.2.291E+07 421.3.039E+07 421.  PEAK XPEAK DPPEAK XDPEAK 3.576E+06 3.590E+02 0. 0. 1.566E+06 3.550E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM					***		
3.790E+06 2.989E+02 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.						7110 315076-07	7111
TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0560 2.7.754E+06 419.2.291E+07 421.3.039E+07 421.  PEAK XPEAK DPPEAK XDPEAK  3.576E+06 3.550E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM	9	- 790E+06	2.089E-02	٥.	ADECAN		
TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM  .0560 2.7.754E+06 419.2.291E+07 421.3.039E+07 421.  PEAK XPEAK DPPEAK XDPEAK  3.576E+06 3.550E+02 0. 0.  TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM	ř		0.	۸.	Ŏ.,		
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PEAK XPEAK DPPEAK XDPEAK 3.576E+06 3.590E+02 0. 0. 3.568E+06 3.550E+02 0. 0. Time DXPM PMAX XPM DPMAX XDPM TPMAX XTPM			4 4 19494			421. 1. A10E4A7	421.
3.576E+06 3.590E+02 0. 0. 3.568E+06 3.550E+02 0. 0. TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM		PEAK	XPEAK		DPPFAK YNPFAK		7611
TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM	3	.576E+06	3.590E+02	٥.	A. ADVENI		
TIME DXPM PMAX XPM DPMAX XDPM TPMAX XTPM	3	.568E+06	3.550E+02	ŏ.	Ŏ.		
The state of the s	TIME	DXPM			XPM DPMAX	YOPM TOMAY	X TIDM
						ART S. MANFANT	431.
PEAK XPEAK DPPFAK XDPFAK	- 4 4,	PEAK	XPEAK		DPPFAK YDPFAK	4031 E1000C+V/	7314
3.354E+06 3.510E+02 0. 0.	3	.354E+06	3.510E+02	0.	0.		
7.245E+06 1.094E+01 0. 0.	4	.245E+06	1.094E+01	0.	0.		

# AFWL HULL Calculation of 1 MT Surface Burst Precursed Case

TIME DXPM PMAX XPM DPMAX XDPM TPM •0650 2.6.496E+06 443.2.025E+07 447.2.652E+ PEAK XPEAK DPPEAK XDPEAK 2.974E+06 3.770E+02 0. 0.	07 445.
**************************************	07 445. A <u>k</u> XTPM
2.974E+06 3.770E+02 0. DPPEAK XDPEAK	AX XTPH
207/4E*00 3.770E*02 0.	
2.VIDFADA 7 47AC.AA A	
7.4.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.2.	
TAME UXPM PMAX XPM ADMAN HORM	
	U/ 9374
PEAR IPPAK NODETAL HOOMING	•••••
7.726E+06 1.981E+02 0. 0. 0.	
2.782E.06 1.709E.02 0.	
ATEL TOPM TOPM TOPM	AX XTPM
05-1 05-100 000 1.649E+07 471. 2.158E+	471.
PEAK XPEAK DPPEAK XDPEAK 2.1586.	71.40
2.402F404 2 200F.44 2 27	
TIME DIPM OMAN ""	
ACROS TO A RESERVE APPROXIMATE TO THE TOPM	
9780 1.511E+07 485. 1.957E+0	7 482.
2-178F406 3-513F400	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
7.00AE484	
TAME DXPM PMAY YOU DOWN	
-0850 2 4 5185-04 APM OPMAX XDPM TPMA	
PEAK YPFAK DODEAL" 47/0 10/03E-0	7 494.
2.197E+06 3.865E+02 0	
1.563E+06 1.803E+02 A	
TIME DAPM PMAX YPM DOMAY HOUSE	
-0900 J. 4.169E+06 500. 1.242F407 777	*******
PEAK IPFAK DOGGAN SUFE 1.0176-0	7 507.
2.114E+06 4.093F+02 0	
1+045E+06	
TIME DAPM PMAX XDM DOMAN NUMBER	
3. 3.877E.06 510. 1.134E.07 E20. 1.489F.03	
PERN JUPAK RABEAN MANAMAN TOTAL TOTA	518.
C+VJEE+VB 4.325F4N2 A	
1.632E+06 1.038E+02 0. TIME DXPM PMAX VEM	
- 1000 DPMAX YIDM TOMAN	XTPM
520. 1.048E+07 E31. 1.37EF-03	
1-960E+06 4-506E+02 0. O. DPEAK XDPEAK	2504
14035F+06 2.493F449 4	
IIME DYDM AMAM YY	
1100 3. 3. 277FAAA APM DPMAX XOPH TPMAX	XTPM
PEAK XPEAK 0000000 551. 1.187E+07	549.
1.466E+06 3.741F-02 A DPEAK XOPEAK	
1-491F+06 2-701F-An A	
1 1 0. 0.	

#### AFWL HULL Calculation of 1 MT Surface Burst Precursed Case

PROBLEM NUMBER
PRESSURE IN PASCALS

13.0041 DISTANCE IN METERS

TIME DXP		XPM DPMAX	XDPM TPMAX	XTPM
	· 2 · 898E • 06	558. 7.775E+06	572• 1•034E+07	569.
PEAK		DPPEAK XDPEAK		
1.334E+06	5 4.385E+02 0.	0.	•	
1.356E+06	5 4.385E+02 0. 5 3.584E+02 0. 4	0.		•
TIME DXPN	1 PMAX	XPM DPMAX	YOPM TPMAX	XTPM
	2.619E+06	575. 6.905F+06	XDPM TPHAX 589. 9.215E+06	589.
PEAN			2011 115125-00	3074
	4.499E+02 0.			
	4.299E+02 0.			
	) 40677ETUS U0	0.		~ ==
TIME DXPM	PMAX	XPM DPMAX	XDPM TPHAX	
	2.387E+06		608. 8.230E+06	605.
PEAK	XPEAK	DPPEAK XDPEAK		
1.170E+06	4.767E+02 0.	0•		
1 * 100E - AG	)	• •		
TIME DXPM	I PMAX	XPM DPMAX	XDPM TPHAX	XTPM
·1500 3·	2.181E+06	608. 5.485E+06	628. 7.372E·06	625.
PEAK	XPEAK	608. 5.485E+06 DPPEAK XDPEAK		
1.105E+06	5.096E.02 0.	0.	·	
1.061E+06	4.214E+02 0.	0.		
TIME DXPM	PMAX	XPH DPMAX	XDPM TPHAX	x TPM
	2-0045+06	675. 4. QREF+04		
DEAK	XPEAK	625. 4.988E+06 DPPEAK XDPEAK	6438 G8113C+00	0411
	4.734E+02 0.			
	4.602E+02 0.			
TIME DXPM		XPM DPMAX	XDPM TPHAX	
		641. 4.546E+06	661. 6.1242.06	658.
PEAK		DPPEAK XDPEAK		
9,4468+05	5.030E+02 0.	0•		
9.408E+05	4.833E+02 0.	0•		
TIME DXPM	PMAX	XPM DPMAX	XDPM TPMAX	XTPM
•1800 4•	1.717E+06	657. 4.115E+06	677. 5.575E+06	673.
PEAK	XPEAK	OPPEAK XDPEAK	*-	-
8.639E+05	4.274E+02 0.	0.		
8.621E+05				
TIME DXPM	PMAX	XPM DPHAX	XDPM TPMAX	XTPM
.1900 4.	1.598E+06	669. 3.775E+06	693. 5.115E+06	685.
PEAK			0.21 21112F.AQ	0054
	4.490E+02 0.	O. O.		
	4.216E+02 0.			
TIME DXPM		XPM DPMAX	WARM PRIMA	V # 514
	1.492E+06		XDPM TPMAX	XTPM
		685. 3.508E+06	709. 4.767E+06	701.
PEAK	XPEAK	OPPEAK XOPEAK		
	4.385E+02 0.	<b>0</b> •		
7.045E+05	4.274E+02 0.	0•		

# AFWL HULL Calculation of 1 MT Surface Burst Precursed Case

PROBLEM NUMBER
PRESSURE IN PASCALS

13.0041
DISTANCE IN METERS

TIME			XPM (	PMAX XDPI		
•2100		1.461E+06	696. 3.246		4 TPMAX 4.423E+06	XTPM
_	PEAK		MADELL	ADPEAK	* ****	715.
7	• 328E + 05	5-108E-02		VO. 21114		
TIMF	• 230E + 05	4-601E-02	0.			
.230n			_XPM D	PMAX XDPA	TPMAX	XTPM
• 2300		1-2455+06	724. 2.804	E+06 747.	3.840E+06	743.
4.	PEAK		MDDEAU	XDPEAK		1434
4.	5145405	5-203E-02 (	• 0•			
TIME	DXPM	PMAX				
·250a		1-119E+06	D MAK	PMAX XDPH	TPMAX	XTPM
	PEAK	XPEAK	747. 2.489	E+06 775.	3.410E+06	766.
5.	926E+05	5.296E+02 0		XDPEAK		
5.	919E+05	5-203E+02 0	~ ~ ~			
TIME	DXPM	PHAX		****		
.2600	5.	1 = 065E + 06	757. 2.350		TPMAX	XTPM
	PEAK	XPEAK	DEDEAR .	789.	3.5266.06	780.
5.	651E+05	5.309F.02 A		CUPEAK		
5.0	045E+05	5-296E+02 0	0.			
LTME	DXPM	PMAX		MAX XDPM	TPMAX	
.2720	6.	1 • 002E • 06	771. 2.195F		3-011E+06	XTPH
	PEAK	XPEAK	DDDEAL -	DPFAK	2.0115-00	794.
5.	504E+05	6+077E+02 0.		- <b>-</b>		
TIME	DXPM	5.387E.02 0.	Ó.			
-280n		PMAX	XPM DP	MAX XOPM	TPMAX	XTPM
45000	PEAK	7+042F+02	782. 2.095E	•06 A16.	2.876E+06	805.
5.1	, , ,	XPEAK 5.323E+02 0.	INDEE A DE LA	DPEAK		
5.1	63F+05	5.188E+02 0.	• •			
TIME	DXPM	PMAX	**			
-2931	6.	9. 186F40S	XPM DPI 794. 1.937E	MADA XAP	TPMAX	XTPM
- •	r Lan	APPAE		66 827.	2.683E+06	816.
6.1	12E+05 8	5.499F+A2 A.		PEAF		
4.9	00E+05	5.549E+02 0.	0 • 0 •			
ITME	DXPM	PMAX		AX XDPM		
•300n	6. 8	9-913E+05	799. 1.887E		TPHAX .	XTPM
	PEAK	XPEAK		PEAK	2.599E+06	822.
6.0	38E+05 6	1.555F+02 A		TEAN		
4.7	72E+05 5	-795E+02 0.	0.			
LIME	DXPM	PMAX	XPM DPM	AX XDPM	TPMAX	v vn.
•320c	D. 5	-266E+05	822. 1.767E+		-426E+06	XTPM
. 34	PEAK	XPEAK		PEAK	4-505-00	850.
4+J2	フコピテリコ コンペア・ハモ	•675F•63 A	0.			
7136		.482E+02 0.	0.			

# AFWL HULL Calculation of 7 MT Surface Burst Precursed Case

PROBLEM NUMBER
PRESSURE IN PASCALS

13.0041
DISTANCE IN METERS

TIME DXPH PMAX XPM DPMAX XDPM TPMAX **XTPH** .3373 6. 7.818E+05 839. 1.647E+06 872. 2.269E+06 667. PEAK XPEAK DPPEAK XDPEAK 5.092E+05 9.006E+02 0. 4.078E+05 5.736E+02 0. 0.

#### AFWL HULL Calculation of 1 MT at 500 Feet Precursed Case

PROBLEM NUMBER
PRESSURE IN PASCALS

13.0048

DISTANCE IN METERS

_							
TIME	DXPM	PMAX	XPM	DPMAX		TPMAX	
.0042	2.	-1.013E+05 XPEAK	239. 5	.F77E-04	1.	0•	0 •
	PEAK			XOPEAK			
0	•	0.		9.335E-05			
0.	•	0.		9.736E-05			
TIME	DXPM		XPM	DPMAX		TPMAX	
•0042		1-123E-03			21.	1.123E+03	239.
	PEAK						
1	.122E+03			3.484E-05			
0.0		0.		3.531E-05			
TIME			XPM	DPHAX		TPMAX	
•0045				.820E-95	21•	1.123E+03	239.
_	PEAK		DPPEAK				
-				2.650E-05			
		0.		2.687E-05		<b>D</b> -0144 m	
TIME				DPMAX		TPHAX	
•004 <del>8</del>					67.	1.123E+03	239.
_	PEAK			XDPEAK			
•		Z.230E+02					
	·	0.		2.041E-05	u-0014	TRMAY	*****
TIME	DXPM		XPM	DPMAX	XUPM	TPMAX	XTPM
•0050		1-1235-03	574. 2	.114E-05	71.	1.123E+03	239.
	PEAK	*** ******					
		Z.250E+02					
O . Time	DXPM	0.	0.0/JE+00	7.291E-06	ummu.	There	XTPM
.0053	טארווי פי	3.074E+06	AFM 3 7	.970E+06	AUPH	TPMAX 1 • 104E • 07	3.
•0027	PEAK	300175.00	DDDEAK	XDPEAK	3.	1.10-5-01	3•
		1.1005401	A	0.			
3.	, , , , ,	1.100E+01 0.	0.	0.			
TIME	DXPM	PMAX	хрн	DOMAY	MOUN	TPMAX	YTDM
.0056		3.927E+08		942E+08		9.7350+08	
• • • • • • •	DFAK	MOPAN	DISPLE AM	- ADEL	•	711326.00	• •
0.		0.	5.809F408	1.000F+00	•		
0.		0.	5.809E+08	0.			
TIME	DXPM		XPM		YOPH	TPMAX	XTPM
.0060	• • • • • • • • • • • • • • • • • • • •	1.009E+09				1.085E+09	
	PEAK	XPEAK	DPPEAK	XDPEAK	450		4.0
<b>0</b> .		1.300E+01	0.	0.			
0.		1.300E+01	0.	ŏ.			
TIME	DXPM	PMAX	XPM	DPMAX	XDPM	TPMAX	XYPM
.0065		1.018E+09				1.219E+09	
	PEAK	XPEAK	DPPEAK	XDPEAK			
4.	500E+08	1-1006-01	0.	0.			
4.	484E+08	3.000E+00	0.	0.			

#### AFWL HULL Calculation of 1 MT at 500 Feet Precursed Case

PROBLEM NUMBER 13.0048
PRESSURE IN PASCALS DISTANCE IN METERS

TIME	DXPM	PMAX		XPM DPMAX	KOPA	TPM1X	XTDM
•007a	2.	1.005F+09		XPM DPMAX 57. 6.306E+08	45.	1.7545+00	50.
	PEAK	XPFAK		DPPEAK XDPEAK		113345.01	374
1.	746F . 08	1.0005.00	ο_	0- ADF,EAN			
0.	. 402 - 50	0-	0.	0.			
TIME	DXPM	PMAX	•	0. 0. XPH DPMAX 69. 6.437E-08	YORK	TOMAY	Y TOM
0075	2.	9-1175+08		69. 6.437F+08	75.	1.7905.09	71.
	PEAK	XPEAK		OPPEAK XOPEAK	, ,	113100.01	, , ,
1 -		1.000E+00	0.	0-			
0.		0.	0.	0.			
TIME	DXPM	PMAX	•••	XPM DPMAX 81. 6.310E+08 DPPEAK XDPEAK	XOPM	TPMAX	X TPM
.0080	2.	8.123E+08		81. 6.310E+08	A5.	1.339E+09	Ala
,	PEAK	XPEAK		BPPEAK YDPEAK	.,,,,,	(1007-0	
0.		0.	0.	0.			
0.		0. 0.	o.	n.			
TIME	DXPM	PMAX	- •	XPM DPMAX 91. 6.075E.08 DPPEAK XDPEAK	XCPM	TPMAX	x TPM
.0065	2.	7.050E+08		91. 6.075E+08	93.	1.275E+09	91.
	PEAK	XPEAK		DPPEAK XDPEAK	, ,	******	
0.		0.	O.	0.			
TIME	DXPH	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
.0090	2.	5.9032.08		99. 6.009E+08	101.	1.178E+09	101.
	PEAK	XPEAK		DPPEAK XDPEAK	• • • •		•••
0+		0.	ø.	XPM DPMAX 99. 6.009E+08 DPPEAK XDPEAK 0.			
0.		0.	0.	XPM DPMAX 107. 5.933E+08 DPPEAK XDPEAK			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPH
.0094	2.	5.338E+08		107. 5.933E+08	107.	1.127E+09	107.
	PEAK	XPEAK		DPPEAK XDPEAK			
0•		0.	0.	0.			
0.		0.	٥.	0. XPM DPMAX 107. 5.865E+08 DPPEAK XOPEAK			
TIME	DXPM	PMAX		XPM DPHAX	XDPM	TPMAX	XTPM
.0095	2.	5.131E+08		107. 5.865E+08	109.	1.080E+09	109.
	PEAK	XPEAK	_	DPPEAK XDPEAK			
0.		0.	0.	O.  O.  XPM DPMAX  115. 5.632E+08  DPDFAK XDPFAK			
0•	0 11 0 14	0.	0.	0.			
TIME	DXPM	ZAM9		XPM DPMAX	XDPM	TPMAX	XTPM
.0100	2.	4.5285.08		115. 5.6J2E+08	115.	1.016E+09	115.
_	PEAK	XPEAK		OPPEAK XOPEAK			
0•		0.	9.	0. 0. XPM DPMAX 127. 5.053E+08			
7745	D = 0+4	U. OMAN	٥.	0.		<b>ma</b>	
TIME	UXPM	PMAX		APM DPMAX	XDPM	TPMAX	XTPM
.0110	0545	3+6/15.08		12/0 3.0532.08	129.	8.199E+08	127.
_	LEWV	AFEAR		UPPEAR XUPEAR			
0.		0.	Ŏ.	0 • 0 •			
0•		V •	V.	0•		•	

PROBLEM !	NUMBER	1	3.	7048			
PRESSURE	IN PA	SCALS C	)15	TANCE IN MEYERS			
TIHE	DXPM	PMAX		XPM DPMAX	XDPH	TPMAX	XTPM
·012n	2.			139. 5.005E+08		7.5656+08	139.
	PEAK	XPEAK		DPPEAK XDPEAK			
9•		0.	0.	0.			
9.		0.	٥.	0.	_		
TIME	DXPM	PMAX		XPM DPMAX 147. 4.878E+08	XDPM	TPMAX	XTPM
.0130	5•	2.151E+08		147. 4.878E+08	149.	6.919E+08	149.
	PEAK			OPPEAK XDPEAK			
0.		0.	0.				
9.		0.	0.	0.			
T I ME	DXPM	PMAX		XPM DPMAX 157. 4.48%E+08	XDPM	TPMAX	XTPM
-0140		1.756E+08		157. 4.495E+08	157.	6.2406.08	157.
	PEAK						
•		0.	0.	ř.			
•		0.	0.	G.		<b>26</b> 14 4 W	w #014
TIME	DXPM	PMAX		XPM DPMAX	HOPM	TPMAX	A IPM
•0150	2.	1.452E+08		165. 4.118E+08 DPPEAK XDPEAK	101.	5.4596.08	165.
	PEAK	_					
<b>Q</b> •		0.	0.	0.			
O•	<b>-</b>	0.	0.	0.		<b>45</b> 14 4 4	~ TDM :
TIML	DXPM	PMAX		XPM DPMAX	XUPM	TPMAX	7 1 7 P
•6160	1.	1.5656.08		172. 3.886E+08 DPPEAK XDPEAK	175.	4.98/2.08	175•
	PEAK		_	UPPEAK XDPEAK			
0.		0.	0.	0.			
40	- 454	0.	~ .	~ ~ ~	×00M	TPMAX	w TDM
TIME	UXPH	PMAX		XPM DPMAX 179. 3.560:+38	XUPM	4.529E+08	182.
.0170	DE AM	1.1005.00		DPPEAK XDPEAK	105.	4.36.46.00	105.
_	PEAK						
0.		0.	٧.	0 • 0 •			
7.45	200	O. PMAX			VARM	TPMAX	XTPM
TIME	UAFM	0 4015407		XPM DPMAX 186. 3.200E+08	AUP M	4+022E+08	1.58.
.0180	PEAK			OPPEAK XOPEAK	1070	410225-00	1000
	PEAN	O.	۸				
0.		0.	0.	0.			
). TIM≔	DABM	PMAX	•	XPM DPMAX	YORM	TPMAX	XTPM
-0190	9.	8-576F+07		192. 2.861E+08	195.	7-6155+08	195.
•0170	PEAK			DPPEAK XDPEAK	1730	210120-00	
a.	PERN	0.					
0.		0.	0.	C. 6.			
TIME	DXPM		~ ,	XPM DPMAX	XDPM	TPMAX	XTPM
.0196				195. 2.696E+08		3.367E+08	
44071	PEAK	XPEAK		DPPEAK XDPEAK	~~~		•
0.				A. 201 CAN			

PROBLEM NUMBER PRESSURE IN PA	SCALS	13.0048 DISTANCE IN METERS	
PEAR	7.675E+07	198. 2,588E+08 203. 3.255E+08 DPPEAK XDPEAK	201•
PEAR	XPEAK	0. 0. 0. 0. 0. 0. XPM DPMAX XDPM TPMAX 204. 2.375E+08 209. 2.971E+08 DPPEAK XDPEAK 0. 0.	
TIME DXPN	0. PMAX 5.631E+07 XPEAK	0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 216. 1.977E+08 221. 2.456E+08 DPPEAK XDPEAK 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	XTPM 219•
PEAR	AFEAN	0. 0. XPM DPMAX XDPM TPMAX 227. 1.644E+08 232. 2.028E+08 DPPEAK XDPEAK 1.031E+08 2.508E+02	XTPM 230•
TIME DXPM .0260 2.	0. PMAX 4-203E+07 XPEAK		
0. TIME DXPM .0280 2.	0. PMAX 3.521E+07 XPEAK	0. 0. XPM DPMAX XDPM TPMAX 242.1.264E+08 249.1.558E+08	XTPM 247.
TIME DXPM .0300 2. PEAK	0. PMAX 2.969E+07 XPEAK	O. O. DPMAX XDPM TPMAX	XTPM 257.
TIME DXPM .0320 2. PEAK	0. PMAX 2.515E+07 XPEAK	0. 0. XPN DPMAX XDPM TPMAX 259. 8.999E+07 269. 1.105E+08	
0. TIME DXPM .0340 2. PEAK 9.643E+06	PMAX 2.159E+07 XPEAK 3.127E+02	0. 0. XPM DPMAX XDPM TPMAX 269. 7.672E+07 280. 9.426E+07 DPPEAK XDPEAK 7.092E+07 3.108E+02	XTPM 278.
<b>9</b> •	0.	0.	

PROBLEM NUMBER PRESSURE IN PASCALS 13.0048 DISTANCE IN METERS

TIME	DXPM	PMAX	XPM	DPMAX	XDPM	TPMAX 70.5560.8	XTPM
•0360	2.	1.869E+07	278. 6	563E+07	322.	8.0622.07	286•
•	PEAK	XPEAK	DPPEAK	XDPEAK			
9.	233E+06	3-2458+02	6.553E + 07	2.8816+02			
	1	0.	0.	Õ.			
TIME	DXPM	PMAX	O. XPM	DPMAX	XDPM	TPMAX	XTPM
.0380	` 2 <b>.</b>	1.635E+07	286. 6	021E+07	333.	6.930E+07	296.
	PEAK	XPEAK	286. 6. Dppeak	XDPEAK	••••		
8.			5.633E+07				
0.		0.	0.	0.			
TIME		PMAX	XPM	DPMAX	XDPM	TPMAX	XTPM
.0400	2.	1.446E+07	292. 5.	617E+07		6.447E+07	
	PEAK	XPEAK	292. S. Oppeak	XDPEAK	•		
8.	483E+06	3.467E+02	4.894E+07	3.063E.02			
0.		0.	0.	0.			
TINE		PHAX	O. XPM	OPMAX	XDPM	TPMAX	XTPM
0420	2.	1.287E+07	300. 5.	177E+07		5.981E+07	
	PEAK	XPEAK	OPPEAK	XDPEAK	••••		•••
8-	106E+06	3.581E+02	4.274E+07	3-1602+02			
1.	253E+06	5.801E+01	0.	0.			
TIME	DXPM	PMAX	XPM	DPMAX	<b>XDPM</b>	TPHAX	XTPH
.0450	2.	1.096E+07	311. 4.	546E+07	370.	5.291E+07	372.
			OPPEAK		•		<b></b>
7.			3-519E+07				
1.	722E+06	8-126E+01	0.	0.			
TIME	DXPN	PMAX	XPM	DPMAX	<b>XDPM</b>	TPHAX	XTPM
.0480	2.	9.450E+06	XPM 321. 4.	105E+07	386.	4.809E+07	386.
	PEAK	XPEAK	DPPEAK	XDPEAK	•		
7.	173E+06	3.886E+02	2.949E+07	3.394E+02			
				0.			
TIME	DXPM	PMAX	XPM	DPMAX	XDPM	TPHAX	XTPM
.0500	2.	8.625E+06	ХРМ 328. 3.	818E+07	396.	4.496E+07	396.
	PEAK	XPEAK	DPPEAK	XDPEAK	•		
6.	929E+06		2.640E+07				
1 • 1	693E+06	1.025E+02	0.	0.			
TIME	DXPM	PMAX	XPM	DPMAX	XDPM	TPHAX	XTPH
.0530	3.	7.545E+06	336. 3. DPPEAK	378E+07		4.009E+07	
	PEAK	XPEAK	OPPEAK	XDPEAK			
6.3	384E+06	4.115E+02	2.241E+07	3.574E-02			
4.	90+3655	8.287E+01	V.	0.			
TIME	DXPM	PMAX	XPM	DPMAX	XDPH	TPMAX	XTPM
• 056n	3.	6.670E+06	344. 3.	030E+07		3.625E+07	
	PEAR	XPEAR	DPPEAK	XDPEAK			
6-1	097E+06	4.251E+02	1.924E+07	3.682E+02			
1.5	312E+06	1.868E+02		0.			

PROBLEM NUMBER 13.004B
PRESSURE IN PASCALS DISTANCE IN METERS

-	A - Au	<b>9344</b> H	u maa	<b>5544</b>		****	
	DXPM	PMAX	XPM 355. 2	DPMAX		TPHAX	
•060n		3.//35.00	J55 2	.0342.07	439.	3-2202+07	441.
	PEAK		DPPEAK				
			1.607E+07				
TIME	DXPM	2.0262.02	V.	0. DPMAX	~65M	TOMAN	v TDM
•065n	UAFM 3	F-21154A4	XPM 463. 2	2505.A7	AUPH 444	TPMAX 2.781E+07	AIPM
• 0050	PEAK	XPEAK	7030 6	XOPEAK	400.	5. LOTE +01	460.
		7.7016402	1.309E+07				
		1.3536+02		0.			
TIME	DXPM	DMAY	YOM	DDHAY	- nau	TPMAX	YTOM
•0700	2-	4-0145464	XPM 481. 1 DPPEAK	0105407		2.401E+07	
•0.00	PEAK	ADLAR	DODEAK	TUDEAR	4/00	\$ • 401F • 01	401.
4	プロフティハム プロフティハム	7.820F+A2	1.084E+07	4.1495402			
	DOBEADA	1.5125.02	Λ.	۸.			
TIME	DXPM	PMAX	XPM 499. 1. DPPEAK	DPMAX	YADM	TPMAX	YTDM
0750	3.	4-605E+06	499- 1	663F+07		2-116E+07	***
	PEAK	XPEAK	DPPEAK	XDPEAK	7,00	511100.01	7770
3.1	775E+06	3-940E+02	9.208E+06	4.298E+02			
		2.673E+02		0.			
TIME			XPM	DPMAX	XDPM	TPMAX	XTPH
.0800		4.215E+06	515. 1.	427E+07		1.843E+07	
	PEAK	XPEAK	DPPEAK	XDPEAK		••••••	
3.5	389E+06	4-045E+02	7.984E+06	4-426E+02			
		1.891E+02		0.			
TIME	DXPM	PHAX	XPM	DPMAX	XDPH	TPMAX	XTPM
•085¢			529. 1.		529.	1.642E+07	529.
	PEAK	XPEAK	DPPEAK	XOPEAK			
			7.002E+06	4.5648+02			
		2.040E+02		0.			
TIME	DXPM	PMAX	XPM	DPMAX	XDPM	TPMAX	XTPM
•0900			546. 1.		546.	1.469E+07	546.
	PEAK	RPEAK	DPPEAK	_			
5.5	135E+06	4.253E+02	0.	0.			
		S.180E.0S		0.			
TIME	DXPM	PMAX	ХРМ 558. 9.	DPMAX		TPMAX	
.0950		3.483E+06	558. 9.	624E+06	550.	1-311E+07	558.
	PEAK	XPEAK	_	XOPEAK			
		4.343E+02	-	0.			
		2.353E+02		0.	u <b>a =</b> · ·	•	
TIME		PMAX	XPM E74	DPMAX		TPMAX	
-1000	PEAK	3.265E+06 XPEAK		444E+06	5/4.	1.171E+07	574.
<b>,</b> .		4-464E+02	DPPEAK				
				0 •			
5.2	200 TUO	2.479E+02	V•	0•			

PROBLEM NUMBER PRESSURE IN PASCALS

13.0046 DISTANCE IN METERS

	<b>5</b> 454		*****	<b>****</b>			
TIME	DXPM		* ** * * * * * * * * * * * * * * * * * *	DPMAX	XDPM		XTPM
·110n		2.966E+06			598.	9.881E+06	598.
_	PEAK			XDPEAK			
		4.624E+02		0.			
		2.774E+02		0.		-	w ## ## ##
TIME	OXPM		XPM	DPMAX		TPMAX	XTPM
•1200		2.623E+06	520. 5.4		023.	8.087E+06	620.
	PEAK			XDPEAK			
		4.766E+02		0•			
TIME		3.084E+02 PMAX	XPH (	D. DPMAX	VARM	TPMAX	XTPM
.1300		2.415E+06	447. A.I			6.996E+06	
• 1 300	PEAK		643. 4.	XDPEAK	0701	011705-00	0431
		4.905E+02		D.	•		
		3.358E • 02					
TIME		PMAX	XPH	DPMAX	хорм	TPMAX	XTPM
•1400			665. 3.0			6-0618+06	
	PEAK	XPEAK				01101010	0000
1.		***	2.776E+06				
		3.532E+02		).			
TIME		PHAX	XPM	DPMAX	XDPH	TPMAX	XTPM
-1500	9.		683. 3.1	17E+06	683.	5.020E+06	683.
	PEAK	XPEAK	OPPEAK	XDPEAK			
1 •	344E+06	5-183E+02	2.378E+06 (	5-284E+02			
Ĩ•	729E+05	3.899E+02	4.103E+05 :	3.991E+02			
TIME		PMAX	XPH	<b>DPMAX</b>	XDPM	TPMAX	XTPM
.1600		1.748E+06	702. 2.7	791E+06	702.	4.5402.06	702.
	PEAK	XPEAK		XDPEAK			
			2.0818.06				
			4.088E+05 4				
TIME		PMAX	XPM	DPMAX		TPMAX	XTPM
-1700		1-616E+06	720. 2.5		720.	4.173E+06	720.
	PEAK	XPEAK					
			1.849E+06 6				
			4.043E+05 4				
TIME	DXPM	PMAX	XPM	DPMAX		TPHAX	XTPM
.1800	PEAK	1.501E+06	729. 2.3		739.	3.843E+06	739.
	,,,,,		DPPEAK	XDPEAK			
			1.666E+06 6				
TIME	DXPM	PMAX	XPM	DPMAX	v004	TPHAX	XTPH
-1855		1.4395.06	739. 2.2			3.668E+06	748.
-1033	PEAK	XPEAK	DPPEAK	XDPEAK	/700	7 + 900 E + A O	7700
1 -			1.583E+06 6				
			4.315E+05 5				
J.							

TIM	E DXPM	PMAX	XPM DPMAX	XDPH	TPMAX	XTPM
-190	-	1.396E+06	748. 2.179E+06	757.	3.527E+06	757.
	PEAK	XPEAK	DPPEAK XDPEAK			
	1.224E+06	5.092E+02	1.523E+06 6.559E+02			
		4.587E+00				
TIM	DXPM	PMAX	XPM DPMAX	XDPM	TPMAX	XTPM
-200	9.	1.294E.06	766. 1.983E+06	775.	3.204E+06	775.
	PEAK	XPEAK	OPPEAK XDPEAK			
1	1.149E+06	5.367E+02	1.406E+06 6.651E+02			
	7.633E+05	4.587E+00	0. 0.			

784. 1.745E+06

DPMAX

XDPEAK

XDPM

TPMAX

794. 2.924E+36

XTPM

784.

XPM

DPPEAK

DISTANCE IN METERS

13.0048

PROBLEM NUMBER

TIME

.2100

PRESSURE IN PASCALS

DXPH

PEAK

PMAX

1.089E+06 5.550E+02 1.31ZE+06 6.835E+02 8.326E+05 4.587E+00 0.

XPEAK

9. 1.200E+06

PROBLEM NUMBER 13.0059
PRESSURE IN PASCALS DISTANCE IN METERS

TIME	DXPM	I DMAY	IDM	DPMAX	*DDM	TPHAX	y TDM
•0103	2.	-1.0136.05	270. 1	DPMAX .571E-05	1.	n.	0.
.0103	DEAK	Y DE AK	UDDEAM	XDPEAK	4.	•	٧.
•	FEAR	A. AFGAN	4. 784F-A4	2.370FA02			
0.		0.	4 1 1 0 0 E - V 0	2.370E+02			
TIME	D. V.D.W	DMAY	V.	Ve DBMAY	VDDM	TPHAX 1.123E:1	VTOM
.0110	UAFR	1 127KAA2	230 2	2070AA	AUTH	I THAN	220
.0110	0544	1.1535.47	634. 5	* 3035-00	501.	1.1536.03	234.
_	PEAR	APEAK	UPPEAR	AUPEAR			
0.		0.	5.4246-61	1.000F.00			
0.	#. v. <b>=</b> 44	9.	0.	0.		TPMAX 1.123E+03	
JIME	DXPM	PMAX	XPM	OPMAX	XDPM	TPHAX	XTPM
·0120	2.	1-1236-03	234. 5	.033E~05	157.	1.1536.03	239.
	PEAK	XPEAK	DPPEAK	XDPEAK			
0.		0.	0.	0.		TPMAX 1.123E+03	
		0.	0.	0.			
TIME	DXPH	PMAX	XPM	OPMAX	XDPM	TPHAX	XTPH
.0130	2.	1.123E+03	239. 6	.006E-05	153.	1.123E+03	239.
	PEAK	XPEAK	DPPEAK	XDPEAK			
0.0		0.	5.554E-05	2.010E+02			
0 •		0.	0.	0.		TPHAX	
TIME	DXPH	PMAX	XPM	DPMAX	XOPH	TPHAX	XTPM
.0140	2.	1.123E+03	239. 1	.202E-04	153.	1.123E+03	239.
	PEAK	XPEAK	DPPEAK	XDPEAK		1.123E+03	
۸۰		0.	1-1025-04	2.010F+02			
0.		0.	0.	0.		TPMAX 1.123E+03	
TIME	DXPM	PHAX	XPM	OPMAX	XDPM	TPHAX	XTPM
.0150	2.	1.123E+03	239. 1	.991E-04	153.	1.123E+03	239.
	PEAK	XPEAK	DPPEAK	XDPEAK			
0+		0.	1.825E-04	XDPEAK 2.010E+02			
Ö.		O. PMAX	Ö.	0.		TPMAX 8.629E+07	
TIME	DXPM	PMAX	XPM	DPMAX	XDPM	TPMAX	XTPM
.0160	2	2 5345.47		4000.40	1.	8-629E+07	1.
	PEAK	XPEAK	DPPEAK	XDPEAK	••		
0.		0.	0.	0.		TPMAX 2.539E+08	
0.		0.	0.	0.		•	
TIME	DXPM	PMAX	хРм	DPMAX	XDPM	TPMAX	TTPM
.0163	1.	9. 380E+07	1. 1.	. AA1F+AA	1.	2.5305-05	1.
	PFAK	XDFAK	OPPEAK	KUDEAK		613316-40	**
0.8	35F+07	7.3222+00	1.5435404	7. 1225400			
0.	336.01	0.	1.2425.40	7.3655.40			
TIME	DXPM	PMAY	XDM	DDMAX	VARM	TPMAX 3.440E+08	VYDM
.0170	1-	3.0315.04	7. 1	LONEANE	37	1777A	7157
.0170	DEAH	ADE VA	UDDE VA	0775400 VADEAY	314	3 • ***VE. * VØ	<b>63</b> 0
0.	FEAR	AFEAN	A.	AUFEAN			
0.		0.	0.	<b>V</b> •			
0•		•	v.	V+			

PROBLEM NUMBER 13.0 PRESSURE IN PASCALS DIST

13.0059 DISTANCE IN METERS

TIM	F DXPA	. DMAY	XPM DPMAX 45. 1.653E 08 DPPEAK XDPEAK 0. 0. 0. 0. XPM DPMAX 67. 1.636E 08 DPPEAK XDPEAK 1.821E+07 4.978E+01		
.018	) ),	7.04BAAA	APH OPMAX	XDPH TPMAX	XTPM
	DRA	* ************************************	45. 1.653E 08	61. J.432E+08	54.
,	- 1015-08	APEAN	DPPEAK XOPEAK		
j		0.0045.00	0.		
7 7 84	, unda	ye Bus	0.		
-0194	DAFA	PMAX	XPM DPMAX	XDPM TPMAX	XTPM
****	DEA =	C+ /845+08	67. 1.636E+08	79. 3.480E+08	70-
	PERR	XPEAK	DPPEAK XDPEAK		, , ,
Ĺ	*****	3.0025.01	1.821E+07 4.978E+01		
7145	0 404	0.	1.821E+07 4.978E+01 0. 0. XPM DPMAX 84.1.632E+08 DPPEAK XDPEAK 2.699E+07 6.920E+01		
476	UXPM	PHAX	XPM DPMAX	XDPM TPMA	VTDU
• 0200		2-6105-08	84. 1.632E+08	91. 3.5525+08	84
_	PEAK	XPEAK	DPPEAK XDPEAK	0000000	951
1	• J45E + 08	6.271E+01	2.699E+07 6.990E+01		
5	. >336.+07	5.247E+60	0. 0.		
TIME	DXPM	PMAX	XPM DPMAX	MOPM TOMAS	U 400 670 AA
•0210	2.	2.337E.08	98. 1.376E+08	105. 7.7555.44	AIPH
	PEAK	XPEAK	OPPEAK KOPFAK	103- 3-3335-08	75,
10	.173E+08	8.107E+01	0.		
0	•	0.	2.699E+07 6.990E+01 0.		
TIME	DKPM	PHAX	XPM DPMAX	VODM TOMAN	
-0230	2.	1.944E+08	121. 1.4295.06	AUPH IPHAX	XTPM
	PEAK	XPEAK	OPPEAK YOUTAN	153. 7.5445.00	121.
1.	80+31+0	1.067E+02	0. 0. XPM OPMAX 121. 1.429E+08 OPPEAK XDPEAK -718E+07 1.104E+02		
0.	1	0. (	7.		
TIME	DXPH	PMAX	-718E+07 1-104E+02 - 0. XPM DPMAX 140. 1.379E+08 DPPEAK XOPEAK - 0. XPM DPMAX	MATERIAL SERVICE	
.0250	2.	1.605E+08	146. 1.370546b	XUPM TPMAX	XTPM
-	PEAK	XPF AK	DBDLAK KOSCAR	142. 5.9136.08	140.
6.	865E+07	1.2955.00 0	DEPEN AUPEAK		
Ö.		6.			
TIME	DXPH	DMAY	VAM AMMAN		
.0260	2.	1 . 304F . A	APH DPMAX	XDPM TPMAX	XTPH
	PEAK	J C - C - C - C - C - C - C - C	1-301E+08	150. 2.731E+08	150.
A-2	280F+07	TENTAN 1.3766an	** 0.		-
Λ.		1. 13E-18 0	• 0•		
TIME	, שפאט		• 0•		
-0280	2. 1	PMAX	XPM DPMAX	XDPM TPMAX	XTPM
-0200	DEAL	1.1005-09	154. 1.339E+08	164. 2.525E+08	164.
9.4	FEAR LAAFAAZ I	APEAK	DPPEAK XDPEAK		
<b>, •</b> •	1-0E 10 1	+32/E+05 0	• 0•		
TIME	0 2 0 4	0.	• 0•		
374 L	UAPM	PMAX	XPM DPMAX )	CDPM TPMAY	YTDM
• 4249	2. 9	+631E+07	177. 1.218E+08	77. 2.1825-00	177
•	PEAK	XPEAK	0. 0. XPM DPMAX 164. 1.339E.08 DPPEAK XDPEAK 0. XPM DPMAX 177. 1.218E.08 DPPEAK XDPEAK		1110
7.	0	• 0.	0.		
0 •	G	• 0.	0.		
			• •		

PROBLEM NUMBER	13.0059		
PRESSURE IN PASCALS	DISTANCE	IN	METERS

						<b>.</b>	were.
TIME	DXPH	PMAX		XPM DPMAX	XDPM		XTPM
.0320	2.			189. 1.157E+08	189.	1.9582.08	189.
	PEAK			OPPEAK XOPEAK			
0•		0.	0.	0.			
0.		0.	٥.	0.		-544	- TOM
TIME	DXPM	PMAX		XPM OPMAX		TPMAX	
•0335	2.	7.098E+07		197. 1.189E+08	144.	1.8862+08	199.
	PEAK	XPEAK	_	OPPEAK XDPEAK			
0.		0.	0.	0.			
0.		0.	٥.	0.	MODM	TOMA	XTPM
TIME	DXPM	PMAX		XPM DPMAX		TPMAX	
•034c	.5	•		201. 1.200E+08	501.	1.892E+08	201.
_	PEAK		•	OPPEAK XDPEAK			
0.		0.	0.	0.			
0.	5 × 5 ×	0.	0.	XPM DPMAX	XOPM	TPMAX	XTPM
TIME	DXPM			XPM			
•0360	2.	6.078E+07			511.	1.0235.00	614-
_	PEAK						
Ç•		0.	0.	0.			
	5 - 5W	Q. PMAX	٥.	XPM DPMAX	VADM	TPMAX	XTPM
TIME	DXPM	FARA TO A T		219. 1.202E.08			
.0380	2.			DPPEAK XDPEAK	561.	10.5.0.00	
_	PEAK		٥.	O. O.			
0.		0. 0.	Ö.	0.			
TIME	DXPH	PMAX	••	XPM DPMAX	<b>XDPM</b>	TPHAX	XTPM
.0400	2.	A.802F+07		229. 1.204E+08			
* 0 + 0 0	PEAK	XPEAK		UPPEAK XOPEAK			
0.	FEAN	0.	0.	0.			
0.		0.	Ö.	0.			
TIME	DXPM	PMAX	••	XPM DPMAX	XDPM	TPMAX	XTPM
•0420	2.	4.242E+07		237. 1.151E+08	239.	1.556E+08	239.
	PEAK	XPEAK		DPPEAK XDPEAK		•	_
0.		0.	0.	0.			
0.		Ŏ.	Ŏ.	Ŏ.			
TIME	DXPM	PMAX		XPM DPMAX	XDPM		
• 0450	2.	3.504E+07		250. 1.040E+08	252.	1.3612.08	252•
· • · - •	PEAK	MPEAK		DPPEAK XDPEAK			
0.		0.	0.	0.			
0.		0.	0.	0.			
TIME	DXPM	PHAX	-	XPM DPMAX	XDPM	TPMAX	
.0480	2.	2.999E+07		260. 9.380E+07	264.	1.1965.08	<b>262.</b>
	PEAK	XPEAK		DPPEAK XDPEAK			
0.		0.	0.	0.			
0 •		0.	0.	Q •			

PROBLEM PRESSURE	NUMBER IN PA	SCALS	13.0059 DISTANCE IN METERS	
TIME	DXPH	PMAX	XPM DPMAX XDPM TPMAX	XTPM
-0500			267. 8.645E+07 271. 1.106E+08	
•0500	PEAK		DPPEAK XDPEAK	
0.	FEAR	0.		
0.		0.	0. 0. 0. 0.	
TIME	DXPH		XPM DPMAX XDPM TPMAX	X TOM
•0530		2.428E+07	XPM DPMAX XDPM TPMAX 276. 7.699E+07 283. 9.820E+07	280.
10330	PEAK	YDEAK	DPPEAK XDPEAK	2404
0.	r GAN	0.	O. O.	
0.		0.	0. 0. 0. 0.	
TIME	DXPM	PMAX	XPM DPMAX XDPM TPMAX	XTPM
.0560	2.	2.333F+07	XPM DPMAX XDPM TPMAX 285. 7.051E+07 292. 8.933E+07	292.
14000	DEAK	YDEAK	DPPEAK XDPEAK	
0.		0.	0. 0.	
0.		Ö.	Ŏ. O.	
TIME	DXPM	PMAX	XPM DPHAX XDPH TPHAX	XTPM
.0600		2-016E+07	297. 6.426E+07 306. 8.156E+07	303.
******	PEAK	MPFAK	297. 6.426E+07 306. 8.156E+07 DPPEAK XDPEAK	2000
0.		0.	0. 0.	
0.		Ŏ.	0. 0. 0. 0.	
TIME	DXPM	PMAX	XPM DPMAX XDPM TPMAX	XTPM
.0650	2.	1.767E+07	XPM DPMAX XDPM TPMAX 315. 5.813E+07 321. 7.318E+07	319.
	PEAK	XPEAK	DPPEAK XDPEAK	
ő•			0. 0.	
Ö•		0. 0.	0. 0.	
TIMĚ	DXPM			XTPM
.0700	Z.	1.5058+07	330. S.095E+07 337. 6.369E+07	
	PEAK	XPEAK	DODEAK YOPFAK	
0.		0.	0. 0. 0. 0.	
Ö.		0.	0. 0.	
TIME	DXPM	PMAX	XPN DPMAX XDPM TPMAX 342. 4.353E+07 352. 5.406E+07	XTPM
.0750	2.	1-267E+07	342. 4.353E+07 352. 5.406E+07	349.
	PEAK	XPEAK	OPPEAK XDPEAK	
n.		0.	0. 0.	
0.		0.	0. 0.	
TIME		PMAX		
.0800		1-074E+07	357. 3.710E+07 368. 4.609E+07	365.
	PEAK	XPEAK		
0.		0•	2.687E+07 3.95JE+02	
0.		0.	0. 0.	
TIME		PMAX		XTPM
.0850		9-191E-06		379.
	PEAK	XPEAK		
3.23	14E+06		2.492E+07 4.115E+0Z	
0 •		0.	0. 0.	

DISTANCE IN METERS

13.0059

PROBLEM NUMBER

PRESSURE IN PASCALS

DXPM

PEAK

TIME

·160n

4.914E+05 2.647E+02 0.

4. 2.141E+06

XPEAK

PMAX

1.853E+06 6.132E+02 7.002E+06 5.333E+02

1.689E+06 6.342E+02 5.946E+06 5.543E+02 1.906E+06 9.819E+01 0. 0.

1 116930116	• • • • •	30/160	.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				
TIME	DXPM	PMAX	XPM	OPHAX	XDPM	TPMAX 70+367E+67	XTPM
.0900	3.	7.959E+06	382. 2	.725E+07	395.	3.376E+07	393.
	PEAK	XPEAK	DPPEAK	XOPEAK	•		
3.0	69E+06	4.332E+02	2.310E+07	4.305E+02			
0.	• • • • • • • • • • • • • • • • • • • •	0.	0.	ű.			
TIME	DXPM	PMAX	XPM	DPMAX	XOPM	TPMAX	XTPM
.0950	3.	6.926E+06	394. 2	.343E+07	409.	2.905E+07	406.
	PEAK	XPEAK	DPPEAK	XOPEAK		_	
2.9	29E+06	4.507E+02	2-139E+07	4.477E+02			
ō.	_	0.	0.	0.		TPMAX 2.525E+07	
TIME	DXPH	PMAX	XPM	DPMAX	XDPM	TPMAX	XIPH
-1000	3.	6.094E+06	406. 2			2.525E+07	418.
				XDPEAK			
2.7	64E+06	4.6862.02	1.966E+07	4.627E+0Z			
		<b>0.</b>	0.	0.		TPMAX 1.958E+07	
TIME	DXPM	PMAX	XPM	DPMAX	XDPM	TPMAX	XTPM
-1100	3.	4.843E+06	427. 1	.703E+07	496.	1.9586+07	442.
				XOPEAK			
	54E+06	2.012E+05	1.577E+07	4.477E+02			
0•		0.	0.	0+		TPMAX 1.691E+07	VERM
TIME	UXPM	ZAM4	APM 1	UPMAX	XUPM	IPHAA	AIFM EST
.1200	3.	3-7435-00	DPPEAK	.401ETU/	261.	FOOTEANI	367.
	PEAN AAAA	APEAR 5 2005.42	UNTEAR	4.706E+02			
5.2	345.00	302776702	1,5436404	401005406			
TIME	NYDM	DMAY	A DM	DDMAY	YDDM	TPMAX 1.486E+07	XTPM
-1300	DAPM	3.297F+06	468. 1.	. 272F+07	ESS.	1.486E+07	555.
11300	DEAK	XPFAK	DODEAK	KODEAK	7574	104000.01	555
2.1	60E+06	5.58HE+02	1.012E+07	4.934E+02			
1.7	24E+06	2-164E+01	0.	0.			
TIME	DXPM	PMAX	XPM	DPMAX	XDPM	TPMAX	XTPM
-1400	4.	2.804E+06	486. 1.	103E+07	581.	1.300E+07	584.
	PEAK	XPEAK	DPPEAK	XDPEAK			
1.9	80E+06	5.878E+02	8.330E+06	5.152E+02			
3.9	42E+05	2.504E+02	0 .	0.			
TIME	DXPM	PMAX	XPN	DPMAX	XDPM	TPMAX	XTPM
.1500	4.	2.433E+06	501. 9.	765E+06	610.	1.161E+07	610.
	PEAK	XPEAK	OPPEAK	XOPEAK			
. 44	E3E . A.L	£ 1748.40	7 4448 444	E 333E.A3			

DPMAX

XDPEAK

XDPM

XTPM

634.

TPHAX

634. 1.019E+07

0.

516. 8.500E+06

XPM

DPPEAK

PROBLEM NUMBER PRESSURE IN PASCALS

13.0059 DISTANCE IN METERS

TIME	OXDM	DMAY	YOM	DOMAY	Y DDM	TPMAX	XTPM
				-591E+06		9.152E+06	
-1.00		XPEAK		XDPEAK	055.	711362 00	0351
1.				5.711E+02			
		3.99EE+01					
TIME				DPMAX	X DPM	TPMAX	XTPM
- 1800	16.	1.722E+06	76. 6	.766E+06		8.2238+76	
-,	PEAK			XDPEAK	• • • • •		• • • • •
1.				5.897E+02			
		5.460E+02					
TIME				DPMAX	XDPM	TPMAX	XTPM
		1.595E+06			702.	7.373E+06	702.
******	PEAK			XDPEAK			
1.	367E+05			6.092E+02			
	GELFARA	5-606FAA2	Λ.	Λ.,			
TIME	DXPH	PMAX	XPM	DPMAX	XDPM	TPMAX	XTPM
.2000	14.	1.489E+06	136. 5	.455E+06	721.	TPMAX 6.740E+06	721.
	PEAR	XPEAR	UPPEAR	XUPEAR			
				6.238E+02			
1.		5.752E+02	0.	0•			
TIME	DXPM	PHAX	XPM	DPMAX	XDPM	TPMAX	XTPM
.2100					741.	6.158E+06	745.
				XDPEAK			
				6.384E+02			
		5.897E+02	0.			****	
TIME	DXPM	PMAX	XPM	DPMAX		TPMAX	
.2300				.029E+06	782.	5.090E+06	702.
		XPEAK		XDPEAK			
				6.689E+02			
		6.126E+02	0.	0.		-	u =044
TIME		PMAX	XPM	UPMAX		TPMAX	
-2401					790.	4.746E+06	790.
_		,		XDPEAK			
				6.828E+02			
1•	UC45-00	2.264E+02	V •	0•			

PROBLEM NUMBER PRESSURE IN PASCALS 13.0060 DISTANCE IN METERS

TIME	UADM	DMAY	VOM	DOMAY	×004	TOMA	VIDM
-0122	2.	_ 1 . 01 7F+05	XPM 239. 6.	4015-04	XUPM	TPMAX	71FM
-015	PEAK	YDEAK	DPPEAK	POTENO	124.	U •	0.0
0		0.		O.			
Ŏ.		0.	~	0.			
TIME					XDPM	TPMAX	XTPM
.0130		1-1235+03	280 B -	QGAF-0A		1.123E+03 -	
	PEAK	XPEAK	UPPEAK	XDPEAK			
1	.122E+03	2.188E+02	3.166E-06	5.882E-06			
0.		<b>U</b> •	4.930E-06				
TIME	DXPM	PKAX	MAX	DPMAX		TPMAX	
-0140	2.	1+123E+03	280. 4.	231E-05	550.	1.123E+03	280-
	FEAR	APEAR	UPPEAX				
			1.738E-05				
7.745		0.				<b>T</b> DM 4 v	V TOM
TIME -0150			XPM	DPMAX		TPMAX	
*0130	PEAK		280. 1.		240.	1-123E+03	280•
1.			DPPEAK 4.393E-05				
0.			7.424E-05				
TIME					<b>XDDM</b>	TPMAX	XTPM
-0160		1.123E+03		733E-04		1.123E+03	
	PEAK						4.00
1.	122E+03		8.384E-05				
Ö.			1.355E-04				
TIME	DXPM	PMAX	XPM	DPHAX	XDPM	TPMAX	XTPM
-0170	2.	1.123E+03	M9X 280. 2.0	699E-04	235.	1.123E+03	250.
	PEAK						
		2.329E.02	1.379E-04	1.903E-04			
0•		0.	2.143E-04	1.904E-04			
TIME	DXPM	XAM9 1.123E+03	XPM	DPMAX	XUPM	TPMAX	XTPM
•01Bn	PEAK	XPEAK	280. 3.4	838E-04	238•	1.123E+03	280•
,			DPPEAK 2.071E-04	XDPEAK			
	1666-03	0.	3.238E-04	3.000E-04			
TIME	DXPM	PHAX	XPM	DPMAX	YORM	TPMAX	YTDM
-0190		1.123E+03	280. 7.9			1 - 123E+03	
• (, • • • •	PEAK	XPEAK	UPPEAK	ADPEAK	-01	141525.03	2001
1.	122E+03		5.390£-03				
0.		0.	7.563E-03 S	5.355E-03			
TIME	DXPM	PMAX	XPM	DPMAX	XDPM	TPMAX	XTPM
.0200		1.123E+03	280. 1.5		48.	1.123E+03	280.
	PEAK	XPEAK	DPPEAK	XDPEAK			
1.	125E+03	2.422E+02	1.406E-01 1	.536E-01			
9.	483E+02	3.861E+01	1.474E-01 1	.558E-01			

PROBLEM NUMBER 13.0060
PRESSURF IN PASCALS DISTANCE IN METERS

T 1	ME DXPM	PHAX	XPM DPMAX	XDPM		XTPM
.02	2.	1.123E+03	280. 7.063E-01	48.	1.123E+03	280.
- • •	PEAK		DPPEAK XOPEAK			
	1.1228+03	2.446E+02	6.377E-01 6.744E-01			
	6.776E+02	3.861E+01	6.551E-01 6.916E-01			
T1	ME DXPM	PMAX	XPM UPMAX	XDPM		XTPM
.02	30 2.	1.123E+03	280. 2.324E+00	137.	1.123E+03	280.
•	PEAK		DPPEAK XDPEAK			
	1.122E+03	2.492E+02	2.275E+00 2.267E+00			
	-4.476E+02	3.861E+01	2.283E+00 2.237E+00			
TI	ME DXPM	PMAX	XPM OPMAX	XDPM	TPMAX	XTPM
• 02		1-123E+03	308. 1.597E+00	141.	1-123E+03	308.
. • •	PEAK					
	1.1228+03	2.541E+02	1.208E+00 1.219E+00			
	-1.698E+03	2967E+01	1.212E+00 1.220E+00			
T 1	ME DXPM				TPMAX	XTPM
.02	60 3.	1-123E+03	308. 2.218E+00	151.	1.123E+03	308.
	PEAK	XPEAK	DPPEAK XDPEAK			
	1.122E+03	2.567E+02	5.297E-01 2.817E-01			
	-2.128E+03	1.303E+02	2.855E-01 2.811E-01			
71	ME DXPM	PHAX	XPM DPMAX	XDPM	TPMAX	
.02		1.123E+03	308. 7.410E+00	30.	1.123E+03	308.
•••	PEAK	XPEAK	DPPEAK XDPEAK			
	1.1228+03	2.619E+02	4.513E+00 5.773E+00			
	6.006E+02	1.432E+02	5.610E+00 5.935E+00			
TI	ME DXPM	PHAX		XOPM		XTPM
• 03		1.123E+03	308. 6.936E+00	143.	1.123E+03	308.
• • • •	PEAK		DPPEAK XDPEAK	_		
	1-122E+03	2.6708+02	6.312E+00 6.102E+00			
	-1.328E+03	1.484E+02	6.680E+00 5.490E+00			
TI	ME DXPM	PHAX		XOPM		XTPM
v 03		1.148E+03	140. 7.005E+00	151.	1.148E+03	140.
	PEAK	XPEAK	DPPEAK XDPEAK	-		
	1.122E+03	2.670E+02	5.614E+00 1.462E+02			
	-5.138E+02					
TI	ME DAPM	PHAX	XPM OPMAX	XDPM	TPMAX	XTPM
.03	_	6.060E+07	3. 5.856E+07	15.	1.175E+08	3.
•••	PEAK	XPEAK	DPPEAK XDPEAK			
	0.	0.	0. 0.			
	0.	0.	0. 0.			
<b>T1</b>	MĚ DXPM	PHAX	XPM DPMAX	XDPM	TPMAX	XTPM
.03		1.249E+08	49. 6.035E+07	68.	1.388E+08	56.
	PEAK	XPEAK	OPPEAK XDPEAK	,		
		8.953E+00				
		2.578E+00				

	8484	<b>***</b>	W 2014	D mas 4 u			w <b>2514</b>
	DXPM	PMAX	XPM	SPMAX	XDPM	80+3566.1	XTPM
.0380		1-1305-08	82. 5	*738E+07	94.	1.7055.08	90.
	PEAK						
5.	0/02-0/	5-160E+01	2+1415+00	9.3/3E.01			
3.	2476+0/	1.4935.+00	0.	0.		TPMAX 1-324E+08	W #514
TIME	UXPM	PMAX	XPM	UPMAX	XDPH	TEMAX	XIPM
-0400	254	1.0335.08	100. 5	• 311E-01	114.	1.3246.08	100.
_	PEAR	XPEAK	DPPEAK	ADPEAR			
		8.395E+01					
3•	510F+01	4-958E+01	0.	0.		<b>TD</b> 144 = =	~ <b>=</b> 014
TIME	UXEM	XAMY	XPM	OPMAX OS9E+G7 XDPEAK	XUPM	TPMAX	
•0416	DE AV	7-4105-0/	122. 5	.0392-07	150.	1.284E.08	155.
_	PEAR	APEAR	DPPEAR	AUPEAN			
2.	0/35-0/	1.0425.02	1+1076+01	1.082E+02			
		7.991E+01 PMAX			~ABM	TOMAN	W 404
SMIT			APM	DEMAX	XUPH	TPMAX	X IPM
• <b>04</b> 21	PEAK	XPEAK	1240 4	.7446707	170.	1.276E+08	120+
,,,			UPPEAR	XDPEAK			
2.	0575-07	8.395E+01	1.5136401	1.123E+02			
IIME		0.7425.07	wex	0.	MODM	(PMAX	VTDM
•045n	UAFM	7 47654A7	76M	UFMRA	XUPM	1-137E+08	148.
*450				XCPEAK	136+	191315-00	1-00
		1.3368.02					
		1.172E.02				•	
TIME	DXPM	101/2E-02	V 0 4	OBMAN	VADM	TOMA	V TDM
J0480	2.	A. 407E407	160. 4	1-05-07	140	TPMAX 1.066E+08	140.
30400		XPEAK	DDDE AV	PIOUEAN	1030	110005-00	1070
4	051F407	1.570E+02	1. UDUFART	1.4705403			
	0312.01	A.	0.	0.			
TIME	DXPM	DMAY	YDM	ODMAY	VADM	TOMAY	Y TDM
.0500	2.	5.916F+07	180. 4.	179F+07	180	TPMAX 1.010E+08	180-
	PEAK	YDEAK	DPPEAK	AUDEVA	1001	110104.00	
3.		1.6878.02	2.089F+07	1.7105402			
		0.		0.			
TIME			XPM		XDPM	TPHAX	X TPM
.0530				490F+A7	195	8-815E+07	195.
	PEAK	XPF AK	DPPFAK	MODEAK	1,24	8.815E+07	
3.4	4245+07	1-874E+02	0	0.			
0-	· ·	1.874E+02	0.	0.			
TIME	DXPM	PMAX	XPM	DPMAX	XDPM	TPMAX	XTPM
.0560		4.346E+07	211. 4.	019E+67	211.	8.365E+07	211.
	PEAK	<b>XPEAK</b>	DPPEAK	XDPEAK		8.365E+07	
Ó.		0.	0.	0.			
0.		0.	0.	0.			

PROBLEM NUMBER
PRESSURE IN PASCALS

13.0060 DISTANCE IN METERS

TIME	DXPM	DMAV		XPM DPMAX	- CBM	TOMAY	VTOM
	WAFM	7.475F447		229. 4.105E+07	72B	7 7006 A 0 7	220
•0600	PEAK	JODISETUI		5544 401035401	667.	1.1002.01	2270
	PEAN	APEAN	^	DPPEAK XDPEAK			
0.		y•	٧.	0.	•		
().	D. V D.M	V+	<b>V</b> •	0. 0. XPM DPMAX 247. 4.070E+07	- DDM	TOMAN	v TOM
TIME	DACIT	2 000EAR		ACM UPMAA	XUPH	T ACCE ACT	AIFM
•0650	70	24707570		247. 4.0792707	241.	1.0005-01	241.
_	PEAK	APEAR	_	OPPEAK XOPEAK			
ű.		0.	0.	0.			
0•	D 4 7144	0.	0.	0. 0. XPM DPMAX 265. 4.349E+07 DPPEAK XDPEAK		<b>48</b> 444	u = A14
TIME	שאַלַת	PMAX		APM UPMAX	XUPM	ZAMMI	X I PM
•0700	J 0	2.546.401		203. 4.3476.07	201.	6.1926.01	203.
_	PERK	APEAK	_	UPPEAR XUPEAR			
0+		0.	0.	0.			
V **	0 = 014	0.	0.	0.			
TIME	UXPM	XAMY		XPM UPMAX	XDPM	TPMAX	XIPM
.0750	J.	5.102F.0\		280. 4.4536.07	583.	9+2/1F+0/	283.
	PEAK	XPEAK	_	XPM DPMAX 280. 4.453E-07 DPPEAK XDPEAK			
0+		V •	0.	9.			
0.	m 8/44	0.	0.	0.		. =	
TIME	DXPM	PMAX		XPM OPMAX	XDPM	PMAX	XTPM
.0781	3.	1.988E-07		298. 4.430E+07	292"	6.417E+07	292.
	PEAK	XPEAK	_	XPM DPMAX 292. 4.430E+07 DPPEAK XDPEAK			
0.		0.	0.	0			
0.	<b></b>	O. PMAX	0.	0. XPM DPMAX 295. 4.422E+07 DPPEAK XDPEAK			
TIME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
.0800	3.	1.890E+07		295. 4.422E+07	298.	6.301E+07	298•
	PEAK	XPEAK	_	DPPEAK XDPEAK			
0.		0.	Ω.	0.			
0.		0.	Ç.	O. XPM DPMAX		<b></b>	
TIME	DXPH	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
.0850	3.	1.657E+07		309. 4.288E+07	312.	5.883E+07	312.
	PEAK	XPEAK		DPPEAK XDPEAK			
. 0.		0.	Ç.	0 • · ·			
0.	<b>-</b>	0.	0.	0.			
TEME	DXPM	PMAX		XPM DPMAX	XDPM	TPMAX	XTPM
.0900	3.	1.431E+07		XPM DPMAX 322. 3.986E+07	328.	5.237E+97	325.
	PEAK	XPEAK		DPPFAK IDPFAK			
0 •		0.	0.	0•			
		0.	0.	0. 0. XPM			
TIME	DXPM	PMAX		XPM UPMAX	XDPM	TPMAX	XTPM
.0450	3.	1.265E+07		334. 3.688E+07	340.	4.8252-07	340•
	FEAN	AFEAN		UPPEAR AUPEAR			
0 •		0.	0.	Q•			
0 •		0.	0.	0.			

AFWL HULL Calculation of 1 MT at 1000 Feet HOB - Precursed Case

PROBLEM I	NUMBER IN PAS	SCALS (	3.0060 DISTANCE IN METERS	
TIME	DXPM	PMAX	XPM DPMAX XDPM TPMAX	XTPM
		1.131E+07		352.
-1000	PEAK	XPEAK		0.00
•	PEAN	O.	0. 0.	
0.		0.	0. 0.	
0. Time	DXPM			XTPM
-1100		9-186E+06	369. 2.777E+07 379. 3.564E+07	376.
*1100	PEAK		DPPEAK XDPEAK	
0.	FERN	0.		
-		0.	0. 0. 0. 0.	
O. Time	DXPM	PMAX		XTPM
•120 <sub>0</sub>	3.	PMAX 7.768E+06	388. 2.362E+07 401. 3.009E+07	398.
11500	PEAK		DPPEAK XDPEAK	
0.		0.	0. 0.	
0.		AL .	i.	
TIMĚ	DXPM	PMAX	XPM OPMAX XDPM TPMAX	XTPM
-1300	4.	6.656E+06	407. 1.972E+07 421. 2.518E+07	418.
0,00	PEAK	XPEAK	0. XPM OPMAX XDPM TPMAX 407.1.972E+07 421.2.518E+07 DPPEAK XDPEAK	
0•		0.	0. 0.	•
ñ.		ve		
TIHË	DAPM	PMAX 5.986E+06	XPM DPMAX XDPM TPMAX	XTPM
-1400	4.	5.986E+06	429. 1.755E+07 443. 2.252E+07	440.
	PEAK	XPEAK	DPPEAK XDPEAK	
0 •		0 -	0. 0.	
0 •		0.	0. 0.	w = BA4
TIME	DXPM	PMAX	XPH DPMAX XDPM TPMAX	XIPM
.1500	4.	5.396E+06	447. 1.594E+07 461. 2.037E+07 OPPEAK XOPEAK	458.
	PEAK		DPPEAK XDPEAK	
0 •		0.	0. 0. 0. 0.	
0.		0.		XTPM
TIME	DXPM	PMAX	XPM DPMAX XDPM TPMAX 465. 1.418E+07 480. 1.808E+07	
•1600				4100
_	PEAK		DPPEAK XOPEAK	
0•		0.	0. 0.	
0•	A 48M	0.		XTPM
TIME	UAPM	PMAX		
-1700	PEAK		484. 1.257E+07 499. 1.597E+07 DPPEAK XDPEAK	7730
. 20			9.325E+06 5.450E+02	
-	736 400	0.	0. 0.	
O. Time	DABM	PMAX	XPM DPMAX XDPM TPMAX	XTPM
.1800	UAFM	3.642E+06	XPM OPMAX XOPM TPMAX 501. 1.108E+07 521. 1.403E+07	517.
- 1 200	PEAK	XDEAK	DPPEAK XDPEAK	
1.2		5.732E+02	8.800E+06 5.692E+02	
1.5		0.	0. 0.	

13.0060

PROBLEM NUMBER

PRODUCE!	140110-1	•	131000			
PRESSURE	IN PA	SCAL5	DISTANCE I	N METERS		
TIME	DXPM	PMAX	XPM	DPMAX	XDPM TPMA 537. 1.235E+0	X XTPM
-1905	4.	J.205E+06	517. 9	.769E+06	537. 1.235E+0	7 533.
- •	PEAR		DPPEAK	XOPEAK		
	105+00			5.933E+02		
0.		0.		0.		
TIME	DAPM	PMAX	XPM	DPMAX	XOPM TPMA	A XTPM
•5000	4.	5.834F.06	533. 8	•633E+06	557. 1.088E+0	7 549.
	PEAR	APEAK	DPPEAK	XDPEAK		
-				6-173E+02		
		0.	0.	0.		
TIME	DXPM	PMAX	ХРМ	DPMAX	XDPM TPMA: 574. 9.599E+0	A XTPM
.2100	4.	2.5236+06	547. 7	•613E+06	574. 9.599E+0	5 569.
- 4	PEAK	XPEAK	DPPEAK	XOPEAK		
	58E + 06		7.274E+06			
<u> </u>	- · · - ·	0.	0.	0.		
TIME	DXPA	PMAX	XPM	DPMAX .387E+06	XDPM TPMA) 684. 7.671E+00	L XTPM
-2300	4.	2.0468.06	578. 6	•387E+06	684. 7.671E+00	600.
	PEAK	XPEAK	DPPEAK	XDPEAK		
9.76	50E+05	6.884E+02	6.077E+06	6.046E+02		
1.54	8E+05	2.603E+02	0.	O. OPMAX SBBE+06 XDPEAK		
TIME	DXPM	PMAX	XPM	DPMAX	XDPM TPMAX	
•2500	7.	1 * \ 0 0 F + 0 P	603. 5	•588E+06	725. 6.467E+06	725.
	PEAK	XPEAK	DPPEAK	XDPEAK		
7.00	76.402	( • 2 Y & E + 0 2	4.7372+05	6.373E+02		
6.45	01+05	A-17AF-00	0.	0.		
1146	UAPR	PMAX	XPM	0. DPMAX .477E+06	XDPM TPMAX	XTPM
·253n	Dr.Au	1.02/6.00	008.5	.4//E+06	730. 6.338E+06	730•
	PEAK	APEAR	DPPEAK	XDPEAK		
8+/4	コにマリフ	7.3405.02	4.796E+06			
7.15	15.02	A-1AAF+00	0.	0.		
TIME	UXPM	PMAX	XPM	DPMAX	XDPM TPMAX	XTPM
.2600	76	1.3046400	618. 5.	2446+06	744. 6.088E+06	744.
0 53	PEAK	XPEAK 7 400E	UPPEAK	XDPEAK		
8.76	15402	0.1005+02	4.504E+06			
7.0E	75.03	9-199E+00	U+	0.		
TIME .280	UAFM	PMAA	APM	DPMAX		
.5000	DEAM	143436400	093. 4.	DPMAX 650E+06 XDPEAK	784. 5.431E+06	784.
- 05	PEAN SCARE	APEAR 7 HOTELAS	UPPEAK	XOPEAK		
7.73	26,702	1.07/2-02	3.776E+06			
TIME	75 7 7 7 5 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	1.034E+01	V•	0.		
•3000	UAFM 4.	7 T T T T T T T T T T T T T T T T T T T	APM	UPMAX	ADPH TPMAX	XTPM
* 2000	DCAF	4 4 1 B ( C 7 U D	XPM 666. 4. DPPEAK	101F-09	818. 4.800E+06	818.
7.194	CCAN	AFEAR A. 3255AA3	3.208E+06	AUPEAK		
7016	LE + DS	1.0345401	J. CUGE + 06	1.025F+05		
## 13¢	UL 7 V 3	1.0345.01	0.	0.		

PROBLEM NUMBER 13.0060
PRESSURE IN PASCALS DISTANCE IN METERS

TIME	DXPM	DMAY	XPM	DPMAX	XDPM	TPMAX	XTPM
TIME	UAPR	1.4305406	488. 3			4.326E+06	857.
•3200		<b>4. —</b>			UJL.	410200 00	
	PEAK			XDPEAK			
				7.334E+02			
7.	656E+05	1.034E+01	0.	0•			W-514
TIME	DXPH	PMAX	XPM	DPMAX		TPMAX	
.3400	6.	9.219E+05	709. 3	.291E+06	889.	3.890E+06	889.
		XPEAK		XDPEAK			
4-	000F+05	8.955E+02		7.527E+02			
		7.685E+01					
	NUPL	PMAY	YPM	DPMAX	XOPH	TPMAX	XTPM
TIME	UAFR	4 7175AAE	728. 2	- GHAF + AA	920.	3.543E+06	920•
• 7000	0.	0.3135.03	DDDEAM	A DOC AN	7641	3.3402 40	
				XDPEAK			
5•	660E+05	9.2050-02	5.1356.00	7.775E+02			
6.	177E+05	1.556E+02	0.	Ç•			
TIME	DAFM	PMAX	XPM	DPMAX		TPMAX	XTPM
.3800	6.	7.530E+05	746. 2	.712E+06	951.	3.230E+06	958.
	PEAK			XDPEAK			
<b>5</b> .	2636+05			8.024E+02			
		1.916E+02					
TIME	DV DU	DMAY	X PM	DPMAX	XDPH	TPMAX	XTPH
	UACH	FURN A. BUSEARE	747. 2	.487E+06	643.	2.979E+06	
•4000					7434	2471.0	
		XPEAK					
4.	974E+05	9.903E+02	1.7156+06	8-250E+02			
5.	3782+05	2.163E+02	0.	0•			

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